Taxonomic Notes on Bornean Dipterocarpaceae, III

by

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This paper succeeds two others (this journal, XIX (1962) 253–319; id., XX (1963) 229–284) in which new species of *Dipterocarpaceae* from Brunei and Malaysian Borneo were described, others reduced to synonymy and reassessments were made of the infrageneric classification of some genera. The first two papers were published as precurors to my Manual of the Dipterocarp trees of Brunei State (O.U.P., 1964); the present similarly precedes a forthcoming supplement to the Brunei Manual to include additional information on the same species, and all further species, that occur in Sarawak. Furthermore, since the Brunei manual was sent for publication, more complete material has been obtained of several taxa there referred to separate and undescribed taxa.

This paper is the last in the present series to be devoted solely to problems in Bornean Dipterocarpaceae. Subsequent papers in this series will directly relate to an eventual revision of the family for Flora Malesiana.

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The plates are the work of Mr. Ahmad Akip, a promising young artist at present attached to the Sarawak Forest Department.

SUMMARY

Anisoptera Korth., sect. *Anisopterae: A. reticulata* Ashton is described.

Dipterocarpus Gaertn.f.: *D. cuspidatus* Ashton is described.

Dryobalanops Gaertn. f.: *D. abnormis* Sloot. is reduced to synonymy with *D. oblongifolius* Dyer.

Vatica L.: Retinodendropis aspera Heim is reduced to *V. sarawakensis* Heim.

The Bornean species previously referred to *V. odorata* Griff. is now identified as *V. mindanensis* Foxw., which is considered to be a subspecies of *V. odorata. V. aerea* Sloot. is reduced to the same subspecies.

5 subspecies are recognised in *V. oblongifolia* Hook. f.

7 new species are described: *V. badiifolia, V. brunigi, V. compressa, V. congesta, V. globosa, V. rotata,* and *V. rynchocarpa.*

Hopea Roxb.: *H. laxa* Sym. is reduced to *H. pachycarpa* (Heim) Sym.

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12 species are described: *H. andersoni* with subspecies, *H. depressinerva,* and *H. megacarpa* in sect. *Hopeae,* subject. *Hopeae; H. aequalis, H. bullatifolia, H. centipeda, H. enicosanthoides, H. pterygota* and *H. tenuinervula* in subsect. *Pierreae* (Heim) Ashton; *H. altocollina, H. kerangasensis* and *H. longirostrata* in sect. *Dryobalanoides* Miq., subsect. *Dryobalanoides;* and *H. mesuoides* in subject. *Sphaerocarpae* (Heim) Ashton.

Shorea Roxb. ex Gaertn. f.: Two new subsections are described: *Polyandrae* in sect. *Richetioides* Heim, and *Sagittatae* in sect. *Muticae* Brandis.

S. meadiana Syrn. is reduced to *scrobiculata* Burck.

2 subspecies are recognised in *S. agami* Ashton.

S. grandiflora Brandis is recognised as a subspecies of *S. hemsleyana* King.

S. leptoclados Sym. is reduced to *S. johorensis* Foxw.

S. rugosa Heim var *uliginosa* (Foxw.) Sym. is reinstated as a species.

17 new species are described: *S. brunnescens* and *S. lunduensis* in sect. *Shoreae,* subsect. *Shoreae: S. cordata* in sect. *Anthoshoreae;* Pierre; *S. alutacea, S. bakoensis, S. cuspidata, S. iliasii, S. macrobalanos,* and *S. mujongensis* in sect. *Richetioides* Heim subsect. *Richetioides; S. polyandra* in subsect. *Polyandrae; S. praestans* and *S. rotundifolia* in sect. *Pachycarpae* Heim; *S. pubistyla and S. carapae* in sect. *Brachypterae* Heim *Brandis* subsect. *Brachypterae; S. foraminigera* and *S. pallidifolia* in sect. *Muticae* subsect. *Muticae;* and *S. sagittatae* in subsect. *Sagittatae.*

ANISOPTERA

Anisoptera reticulata Ashton sp. nov **Plate 1.**

Species floribus ut in sectione sed foliis ramulisque glabris intercostis subreticulatis.

Foliae ramulique glabri. Ramuli apices versus c. 2 mm. diam. teretes ruguli fusci; internodis –1.5 cm. longis; cicatricibus stipularibus brevibus horizontalibus. Gemmae –2 × 2 mm. ovoideae subacutae. Stipulae ignotae. Lamina 4.5–13 × 2.2–5.5 cm. elliptico-obovata coriacea basim versus late cuneata, apice in acumen –5 mm. longum breve abrupte terminata; costis lateralibus utrinsecus 9–14 curvatis subtus prominentibus angulo 60–65° exorientibus; intercostis subreticulatis; costa media supra applanata vel subdepressa subtus prominenti. Petiolus 15–35 mm. longus, c. 2 mm. diam. teres prominente geniculatus apicem versus tumescens, in sicco niger. Racemi –6 cm. longi, terminales vel axillares breves teretes plus minus persistente aureo-pubescentes stipitis basi in fructu –3 mm. diam. semel ramosi. Alabastrum –8 × 3 mm. fusiforme. Lobi calycis anguste deltoidei inaequales valvati. Petala lorata cremia partibus in alabastro expositis pubescentibus. Stamina c. 35 subaequalia, filamentis brevibus compressis antheris oblongis attenuatis aristis filiformibus. Stylopodium oblongum obtusum pubescente. Pedicellus in fructu –4 mm. longus –3 mm. diam. crassus prominens. Calyx in fructu sparsim caduce aureopubescens, tubo –2 cm. diam. subgloboso; lobis longioribus 2, –13 × 3 cm. lorato-spatulatis obtusis basim versus –9 mm. latis attenuatis; lobis brevioribus 3, –20 × 3 mm. lineare-lanceolatis acutis. Nux apicem versus conferte persistente alutaceo-pubescens stylopodio –4 mm. longo –3 mm. diam. oblongo obtuso pubescenti coronata.

Collections.—Sabah: SAN. 12864 (Wood) SAN. 15172 (Wood) (Holotypus in Herb. Kew) Ulu Sipitang; Brunei: Hotta 12988, Bt. Teraja; Sarawak: S. 1503 (Drahman) Lawas.

This distinctive species resembles *A. marginata* Korth. of the swamps but differs however in the c. 35, not c. 25, stamens, larger fruits, fewer nerves, subreticulate intercostals, and lustrous entirely glabrous thickly coriaceous lamina. It appears to be rare and found in Mixed Dipterocarp forest on leached yellow sandy soils.

DIPTEROCARPUS

Dipterocarpus cuspidatus Ashton sp. nov. **Plate 2.**

D. eurhynchi Miq. affinis sed petiole longiore lamina cuspidata alis tubi nucis latioribus differt.

Gemma conferte persistente longe alutaceo-tomentosa; stipulae externe (intus glabrae) ramuli petioli costa media supra nervi laminarum subtus sparsim longe subpersistente fusco-tomentosi. Ramuli apices versus c. 1 mm. diam. graciles teretes multo ramosi griseo-brunnei; internodis –2 cm. longis, cicatricibus stipularibus gracilibus obscuris. Gemmae –7×3 mm. oblongae. Stipulae –18×5 mm. lineares caducae. Lamina 6–11×2–4 cm. anguste elliptico-ovata applanata in statu expanso vix plicata; basi acuta vel rare cuneata; apice in acumen –2 cm. longum gracile prominente cuspidatum attenuata; costis lateralibus utrinsecus 8–9 gracilibus sed subtus prominentibus angulo 35–45° exorientibus; intercostis conferte scalariformibus; costa media gracili subtus prominenti. Petiolus 12–18 mm. longus c. 1 mm. diam. gracilis geniculatus apicem versus tumescens. Flores ignoti. Racemi –5 cm. longi stipitis basi in fructu c. 2 mm. diam. terminales vel axilares teretes graciles sparsim persistente longi fusco-tomentosi semel ramosi. Pedicellus in fructu –5 mm. longus c. 2 mm. diam. prominens. Calyx in fructu glaber; lobis longioribus 2, –8×1.8 cm. spatulatis obtusis vel subacutis basim versus 4–6 mm. latis attenuatis; lobis brevioribus 3, –9×4 mm. oblongis obtusis subrevolutis; tubo –2 cm. longo –1.8 cm. diam. alis prominentibus 5 chartaceis subundulatis basim versus attenuatis sed apicibus –9 mm. latis subauriculatis. Nux –3×1.6 cm. ovoidea supra tubum maxime extrusa.

Collections.—Sarawak: S. 15138 (Ilias Paie), S. 22061, 22064 (Ashton) Segan F. R.; S. 22058 (Ashton) Ulu Segan: S. 15821 (Ilias Paie) Labang F. R., Bintulu (Holotypus in Herb. Kew).

The leaves of this species resemble in shape the sapling leaves of *D. eurhynchus* Miq., thus differing from the leaves of the type specimen of that species only in their smaller average size. The relatively longer petiole and cuspidate acumen serve to distinguish this species at once from mature *D. eurhynchus,* with which it certainly appears to be closely allied, as well as the fruit with its broader, distally subauriculate, aliform processes on the tube. The species appears to be a local endemic of central northern Sarawak, where it is found on low hills in Mixed Dipterocarp forest on arenaceous soils.

DRYOBALANOPS

The identity of Dryobalanops abnormis Sloot.

Dryobalanops oblongifolia Dyer (J. Bot. 12 (1874) 100) was originally based on two collections, Beccari 2533 from G. Matang, Sarawak, and Beccari 3734 from Bintulu; the latter was later cited as type of *D. kayanensis* Becc., a synonym of *D. lanceolata,* so that Beccari 2533 becomes lectotype. Brandis (J. Linn. Soc. Bot. 31 (1895) 51) first described the fruits, from Beccari 2993, also from Matang.

In his revision of the genus *Dryobalanops* Van Slooten (Bull. Jard. Bot. Btzg. 12 (1932) 22) correctly reduced *Baillonodendron malayanum* Heim (Bull. Soc. Linn. Paris, 2 (1891) 867) and *Dryobalanops beccariana* Ridl. (Fl. Mal. Pen. I (1922) 211) to *D. oblongifolius* Dyer. Nevertheless his description of *D. oblongifolius* fruit is clearly based on Malayan and Sumatran material, and his illustration shows Malayan fruit, and leaves that in their shape and their revolute bases appear characteristic of *D. lanceolata* Burck and not of this species.

Van Slooten founded *D. abnormis* (Bull. Jard. Bot. Btzg. 16 (1940) 449) on 9 numbers from West and South Indonesian Borneo, two of which, bb. 29641 and 30213, from near Tjatit, Melawi, Kapuas, bear fruit; I choose the latter (at BO) as lectotype. He states that *D. abnormis* differs from *D. oblongifolius* 'among other characters . . . by its larger rigid leaves, its lenticellate and differently shaped calyx tubes, and its nuts, which are lenticellose and smooth'; elsewhere he states that the calyx tube is constricted medially and longer in *D. abnormis* than in *D. oblongifolius:* furthermore the sepals in *D. abnormis* are deltoid and prominent, whereas in *D. oblongifolius* they are reduced almost to an undulating ring. Though these comparisons are, with the exception of the length and construction of the calyx tube which depends on the ripeness of the fruit, valid between *D. abnormis* and Malayan material of *D. oblongifolius,* the Beccari type and his fruiting collection collected nearby match *D. abnormis,* so that *D. abnormis* must be considered a synomym.

The lamina dimensions quoted by Van Slooten under the two names overlap and those quoted for Bornean *D. abnormis* are well within the range of Malayan and Sumatran *D. oblongifolius* specimens now at my disposal. I do not on present evidence consider that the Malayan and Sumatran specimens represents a separate taxon.

VATICA

The identity of Retinodendropsis Heim.

This genus was described (Compt. Rend. Ass. Franc. Pau 1892 (1893) 470) from a single number, Lowe s.n., consisting of two shoots bearing somewhat fragmentary leafy twigs, inflorescences, and part of a fruit, in the Kew herbarium; the single species, *R. aspera* Heim, was published in the same paper.

Heim described the anatomy of the parts available to him in considerable detail. He concluded that the material represented a dipterocarp, whose fruit recalled those of the genus *Retinodendron* Korth. (synonymous with the type section of *Vatica,* see Ashton, Gard. Bull. Sing. 20 (1963) 264), though with a thinner pericarp than usual and with ascending, not reflexed, sepals. He noted that in other characters it resembled his own *Vatica sarawakensis,* founded on Beccari 3018 from Sarawak, which is a flowering collection. Heim, whose generic concepts were extremely narrow (see Ashton, loc. cit.) considered that as the material was inadequate to confirm its position in *Retinodendron* a new genus should be created for it!

The specimen is without doubt one of *V. sarawakensis* Heim bearing immature fruit. In this species the fruit calyx lobes are at first ascending, as in the specimen, and become reflexted as the fruit ripens.

The identity of Vatica mindanensis Foxw. and Vatica aerea Sloot.

Vatica mindanensis was founded on Elmer 13680 with young fruit, and 13398 and 13359 with flowers from Mr. Urdaneta, Cabadbaran, Agusan Province, Mindanao.

Vatica sorsogonensis was later described from Elmer 16840, from Mt. Bulusan, Irosin, Sorsogon, Luzon and clearly represents a fruiting specimen of the same taxon. The complete material of *V. mindanensis* is found to be identical with *V. odorata* (Griff) Sym. as it occurs in Borneo. Furthermore *V. odorata* in Borneo occurs typically between 350–1,300 m. altitude, as also does *V. mindanensis* in the Philippines.

V. mindanensis differs from the type and other mainland material of *V. odorata* in having a somewhat longer, more or less geniculate, petiole, and lamina drying greyish, not yellow-brown. The ranges in petiole length overlap, and I consider that *V. mindanensis* should be considered as a subspecies of *V. odorata.*

Bornean material has been separately described by Van Slooten under the name *Vatica aerea* (Bull. Jard. Bot. Btzg. 3, 17 (1942) 133) based on bb. 26438 (Budding), a fruiting collection from Tjatit B. Tengkoejoeng, Melawi; this decision is based on my examination of the isotype in the Leiden herbarium; the Holotype is at Bogor.

V. odorata (Griff.) Sym. ss. odorata.

Petiole 6–18 mm. long, not geniculate; lamina drying yellow-brown.

Type: Griffith s.n., Mergui (K).

Distribution.—Indo-China, Thailand, Peninsular Burma, Malaya, West Borneo.

ssp. mindanensis (Foxw.) Ashton., stat. nov.

Lectotype: Elmer 13398, Mt. Urdaneta, Mindanao (K).

V. mindanensis Foxw., Leafl. Philip. Bot. 6 (1913) 1957.
1957.

V. sorsogonensis Foxw., Philip. J. Sc. Bot. 13 (1918) 196.
196.

V. aerea Sloot., Bull. Jard. Bot. Btzg. 3, 17 (1942) 241.

Petiolus 15–20 mm. longus, plus minus geniculatus, lamina delapsa sicco grisea.

Distribution.—Borneo, Philippines.

Intraspecific variation in V. oblongifolia Hook. f. Plate 3–7.

Lowe s.n. (K), the fruiting specimen upon which this species is based, is clearly distinguishable from other species in the type section of *Vatica* both by its stout compressed twigs, narrowly oblong-obovate thickly coriaceous leaves (blue-green when fresh), and vinous tomentum. Nevertheless 4 distinct taxa, sharing these characters but each differing in lesser criteria, including the number and appearance of the nerves, length of the petiole, size of lamina and twigs, and size and shape of the fruit sepals, exist. Each of these 4 taxa have a well defined geographical and ecological distribution and I have not seen two sharing a common habitat. In view of their close similarity, however, I perfer on present evidence to regard them as subspecies, though intermediate forms have not as yet been found.

Subspecies oblongifolia.—Ramuli c. 4×2 mm. diam. crassi. Lamina 10–31×4.5–10 cm. obovata vel oblonga basi obtusa acumine brevi lato; costis lateralibus utrinsecus 10–18 subtus prominentibus. Petiolus 2.5–5 cm. longus. Lobi calycis in fructu –3×2 mm. deltoidei acuti.

Collections.—Lowe, s.n. Borneo (Holotypus in herb Kew). Sarawak: S. 21550, 21560 (Ashton) Batu Empar, Santubong; S. 15907 (Brain) Nyabau F.R., S. 9618 (Ariffin) Lundu; S. 9605 (Ariffin) G. Pueh F.R.; S. 8644 (Brunig) Similajau F.R., S. 7980 (Bojeng) G. Gading; S. 12783 (Hj. Bujang) G. Santubong; S. 13145, 13251 (Smythies) S. Bena, Kapit; S. 22293 (Suib) Bt. Raya, Kapit; S. 12816 (Asah) Semengoh F.R.; Kep. 358 (Omar) Bt. Siol; S. 13305 (Ilias) G. Periggi; S. 21371 (Othman) Bt. Lambir. Brunei: Brun. 5683 (Ashton) K. Belalong; Brun. 2625 (Ashton) Andulau F.R.; Kep. 48222 (Wyatt-Smith) Badas-Labi road; Kep. 80112 (Wyatt-Smith) Peradayan F.R. Sabah: SAN. 16424 (Wood and Charrington) Timbang Batu, Kudat; SAN. 16660 (Wood) Ulu Moyah Sipitang; SAN. 23857 (Jad Binting) Pulau Sepanggor, Jesselton; SAN. 32014 (Mikil) Halogilat, Beaufort; SAN. 20702 (Meijer) Bt. Ataidon, Ranau.

Distribution.—Throughout Sarawak to western Sabah. Found on shallow leached loams derived from both granite, sandstone, and shale.

Subspecies selakoensis Ashton, ssp. nov. Ramuli c. 2×1 mm. graciles. Lamina 6.5–22×2.5–6.5 cm. anguste elliptica basi cuneata apice in acumen –1.5 cm. longum angustum attenuata, costis lateralibus utrinsecus 11–18 gracilibus subtus vix elevatis. Petiolus 1.5–2.5 cm. longus. Lobi calycis in fructu –4×3 mm. oblongi obtusi.

Collections.—Sarawak: S. 18466 (Chai), S. 13340 (Ilias) (Holotypus in herb Kew), S. 12619 (Smythies), S. 9639 (Ariffin), Sinclair and Kadim 10387, G. Gading F.R.; S. 13171, 13174 (Smythies) G. Berumput.

Distribution.—Found on shallow leached raw-humus bearing soil above 600 m. alt. on the upper slopes and summits of the granodiorite mountains of W. Sarawak. Ssp. *oblongifolia* and ssp. *multinervosa* occur on the same mountains but at lower altitudes.

Subspecies crassilobata Ashton, ssp. nov. Ramuli c. 4 × 2 mm. crassi. Lamina 11.5–21 × 4.5–10.5 cm. late oblonga basi obtusa vel cordata apice in acumen breve latum attenuata; costis lateralibus utrinsecus 16–23 crassi subtus prominentibus. Petiolus 1.8–2.8 cm. longus. Lobi calycis in fructu –15 × 12 mm. obovati obtusi vel emarginati subrotati.

Collections.—Brunei: Brun. 614 (Holotypus in Herb. Kew), 615 (Ashton), S. 2246, 5601 (Anderson), Andulau F.R.; Brun. 5157 (Ashton) Berakas F.R.; Hotta 13002, Bt. Puan. Sarawak: Fuchs 21371, Bt. Pesu, Ulu Semut, Tubau; s.n. (Anderson) Bt. Gaharu.

Distribution.—Local, in Sarawak and Brunei, on strongly leached very deep pale yellow sandy soils derived from poorly consolidated soft sandstones and clays.

Subspecies multinervosa Ashton ssp. nov. Ramuli c. 4 × 2 mm. crassi. Lamina 14–31 × 4–8.5 cm. anguste obovata basi anguste obtusa vel cuneata apice in acumen –1.5 cm. longum gracile attenuata; costis lateralibus utrinsecus 18–27 subtus prominentissime elevatis intercostis prominentibus. Petiolus 1.5–2.5 cm. longus. Lobi calycis in fructu –13 × 8 mm. oblongi obtusi reflexi.

Collections.—Sarawak: S. 22239, 22240, 22295 (Suib) Bt. Raya, Kapit; S. 17739 (Ashton) Ulu Belaga; S. 12623 (Smythies) G. Gading. Brunei: S. 5786 (Wood, Smythies, Ashton) Bt. Biang. Sabah: SAN. 26077 (Muin Chai) Takun, Lahad Datu; SAN. 18475 (Martyn) Ulu Kelumpang, Tawau; SAN. 26029 (Meijer and Muin Chai) Mt. Silam, Lahad Datu; SAN. 30052(Aban) Beradaya F.R., Tawau; SAN. 29835 (Muin Chai) Kelumpang, Tawau; SAN. 19713 (Meijer) (Holotypus in herb. Kew), SAN. 22509 (Singh) Sepilok F.R.; SAN. 34083 (Aban) Ayer Panas, Tawau.

Distribution.—Throughout Sarawak, Brunei and Sabah, on relatively fertile clay rich latosolic soils.

Subspecies elliptifolia Ashton ssp. nov. Ramuli c. 3 × 2 mm. Lamina 12–20–3.5–7 cm. elliptico vel obovata basi late cuneata apice in acumen –1 cm. longum breve attenuata; costis lateralibus utrinsecus 14–16 gracilibus subtus prominentibus. Petiolus 10–14 mm. longus brevis. Lobi calycis in fructu –8 × 4 mm. oblongi obtusi revoluti.

Collections.—Brunei: Brun. 925 (Ashton) Andulau hills at Bt. Kukub (Holotypus in Herb. Kew). Sarawak: S. 23225 (Sibat) Bt. Iju, Arip, Balingian.

Distribution.—Known only from these two collections from Mixed Dipterocarp forest, the one from leached yellow sands overlying the Seria formation, the other from similar soils on the Arip rhyolite.

Vatica badiifolia Ashton. **Plate 8.**

V. bantamensis Sensu Ashton, Man. Dipt. Brun. (1964), 67, non Burck.

V. bantamensis (Hassk.) Burck affinis, sed lamina delapsa in sicco badia costis lateralibus utrinsecus 6–10 costa media supra prominente elevata tomento roseo-brunneo differt.

Ramuli apices versus racemi gemmae stipulae petiolique plus minus conferte caduce pulverulente fulvo-tomentosi. Ramuli apices versus –3 mm. diam. teretes vel costati dein levescentes pallide roseo-brunnescentes; internodis 1.5–2 cm. longis. Gemma –1.5 × 1 mm. ovoidea subacuta. Stipula –5 × 1.5 mm. hastata acuta. Lamina 7.5–15 × 3–6.5 cm. coriacea plus minus elliptica; basi plus minus cuneata, apice in acumen –5 mm. longum deltoideum attenuata; costis lateralibus utrinsecus 9–12 curvatis subtus prominentibus teretibus supra paullum elevatis. Petiolus 2–3.5 cm. longus –3 mm. apicem versus incrassatus geniculatus sicco fulvescens vel nigrescens. Lamina delapsa sicco badius. Racemi –8 cm. longi stipitis basi in fructu –2 mm. diam., terminales vel axillares semel vel bis ramosi. Alabastrum –1.3 cm. longum; calyx conferte breviter cremio-pubescens; flores aliter ut in *Vaticis* aliis. Pedicellus in fructu –5 mm. longus –1 mm. diam. gracilis. Lobi calycis in fructu caduce badio-tomentosi ad basim liberi; longioribus 2, –8 × 2.5 cm. chartaceis oblongo-spatulatis basi –8 mm. latis constrictis; brevioribus 3, –30 × 8 mm. hastatis acutis basi –4 mm. latis constrictis. Nux –8× 8 mm. globosa breviter plane badio-pubescens stylo –2 mm. longo lineari, coronata.

Collections.—Sarawak: S. 15857 (Ilias and Johnson) Similajau, Labang F.R. (Holotypus in herb. Kew); S. 22080 (Ashton) Nyabau reservoir. Brunei: S. 2115, 2120 (Smythies) Bt. Teraja; Kep. 47025 (Smith) 'Brunei'; Kep. 48135 (Flemmich) Balai Rotan; Kep. 39650 (Durant) Labi F.R.

This species, found on yellow sandy loams in Mixed Dipterocarp forest from the Belait valley to the lower Rejang in northern coastal Borneo, bears a close superficial resemblance to *V. bantamensis* (Hassk.) Burck of West Java; the two can be differentiated as follows:

V. badiifolia	*V. bantamensis*
Lamina drying chestnut-brown.	Lamina drying grey-green.
Nerves 6–10 pairs, stout.	Nerves 8–11 pairs, slender.
Midrib prominently raised above.	Midrib more or less applanate above.
Petiole 2.2–3.5 cm. long.	Petiole 1–2 cm. long.
Tomentum pink-brown.	Tomentum buff.

Vatica brunigi Ashton sp. nov. **Plate 9.**

V. maingayi Dyer affinis sed lamina petiolo ramulisque conferte breviter ochraceo-tomentosa costis lateralibus subtus haud prominentibus differt.

Ramuli apices versus gemmae stipuli lamina subtus petiolique breviter alutaceo-scabrido-tomentosi, lamina supra fugace floccosa tomentosa. Ramuli apices versus c. 2 mm. diam. graciles teretes; internodis –1.5 cm. longis brevibus. Gemmae –3 × 2 mm. ovoideo-conicae obtusae. Stipulae –5 × 2 mm. loratae obtusae. Lamina 6–12 × 2.5–6.5 cm. ovato-elliptica vel obovata basi cuneata vel obtusa apice in acumen –1 cm. longum attenuata; costis lateralibus utrinsecus 9–12 gracilibus subtus paullum elevatis angulo 65°–80° exorientibus; costa media supra vix elevata subtus prominenti; intercostis scalariformibus supra obscuris subtus paullum elevatis. Petiolus 8–15 mm. longus c. 1.5 mm. diam. Racemi –12 cm. longi, stipitis basi in fructu –2 mm. diam.; teretes vel angulati conferte breviter persistente ochraceo-scabrido-tomentosi terminales vel apices ramulorum versus axillares semel (axillares) vel bis (terminales) ramosi; ramulis –6 cm. longis; flores distichos gerentibus; bracteolis –3 × 1 mm. ellipticis sparsim pubescentibus. Alabastrum –8 × 2 mm. ellipsoideum. Calyx conferte breviter ochraceo-griseo-pubescens; petala cremia anguste oblonga obtusa externe sparsim pubescentia intus glabra; aristae breves erectae; stylum columellare quam ovarium longiore; flores aliter ut in *Vaticis* aliis. Pedicellus calyxque in fructu sparsim alutaceo-pubescens, nux scabrido-alutaceo-pubescens. Pedicellus –3 mm. longus –1 mm. diam., gracilis. Lobi calycis longiores 2, –6.5 × 1.5 cm. lorati vel spathulati obtusi; breviores 3, –15 × 6 mm. ovati acuti paullum recurvati. Nux –9 × 7 mm. ovoidea subacuta.

Collections.—Brunei: S. 1011, 12352 (Brunig) Ulu Ingei. Sarawak: S. 17045 (Ilias Paie) (Holotypus in Herb. Kew) Sabal F.R.; S. 6758, 17451 (Brunig), S. 17885, 17871 (Ilias Paie), S. 17300 (Ilias Paie and Paul Chai) Bako National Park; S. 18389 (Ashton) Tubau; S. 6437, 7132 (Brunig) G. Pueh F.R.; S. 5969 (Brunig) Sempadi F.R.; S. 8256 (Yakup), S. 1484 (Dan) Marudi F.R.; S. 6524 (Yakup) Kampong Mienki, Ulu Sebuyau, Simanggang; S. 8937 (Yakup) Setapok F.R.

At once distinguished by the densely shortly evenly yellowish buff lamina undersurface, this further addition to Section *Sunaptea* (Griff.) Burck is found throughout Sarawak north-eastward to the Belait basin of Brunei. It is named in honour of Dr. E. F. W. O. Brunig, who is contributing so much to our knowledge of the floristics and ecology of Heath forest in Borneo.

This species was not known to me from Brunei when I compiled the Manual of Dipterocarp trees for that State.

Vatica compressa Ashton sp. nov. **Plate 10.**

V. maritimae Sloot. affinis sed ramulo compresso, lamina intercostis remotioribus, petiolo 15–23 mm. longo glabrescenti differt.

Novelli breviter plane pallide roseo-pubescentes stipulae intus exceptae, gemmae stipulaeque externe persistente pubescentes partes aliter glabri. Ramuli apices versus c. 3 × 1 mm. compressi pallide fusci leves; internodis –3 cm. longis; cicatricibus stipularibus primo c. 2 mm. longis pallidis horizontalibus vel descensis prominentibus. Gemmae c. 3 × 3 mm. ovoideae acutae compressae. Stipulae –4–1.2 cm. oblongae obtusae subcaducae. Lamina 11–19 × 5–8.5 cm. ovato-elliptica coriacea basi obtusa apice in acumen –1 cm. longum attenuata; costis lateralibus utrinsecus 10–15 gracilibus subtus paullum elevatis haud prominentibus supra vix elevatis curvatis angulo c. 50° exorientibus, secundariis brevibus obscuris; intercostis scalariformibus; costa media subtus prominenti supra applanata vel elevata. Petiolus 15–23 mm. longus c. 2 mm. diam. sicco nigrescens. Racemi–7 cm. longi, basim versus – mm. diam. paullum compressi sparsim pallide roseo-brunneo-pubescentes, irregulariter semel vel bis ramosi. Alabrastrum –9 × 4 mm. lanceolatum. Calyx conferte pallide fulvo-pubescens; corolla cremia partibus in alabastro expositis conferte pubescentibus; flores aliter ut in *Vaticis* aliis. Pedicellus in fructu –8 mm. longus, –1 mm. diam. gracilis pubescens. Calyx in fructu puberulens vel glabrescens; lobis longioribus 2, –6.5 × 1 cm. loratis plus minus obtusis basim versus c. 3 mm. latis gradatim attenuatis; lobis brevioribus 3, –20 × 6 mm. deltoideis acutis revolutis. Nux –5 mm. diam. breviter ovoidea conferte breviter alutaceo-pubescens, stylo –3 mm. longo glabro coronata.

Collections.—Sarawak: SFN. 35618 (Daud and Tachun) Hutan Setapok (Holotypus in herb. Kepong); S. 309 (Mead), SA. 604 (Igon) Mile 6 F.R., Kuching; S. 6101, 5984 (Brunig) Sempadi F.R.; S. 6604 (Brunig) Bako N.P.; S. 13275 (Anderson) S. Klauh, Simangang.

A species which is locally frequent on poorly drained sandy podsols in Heath forest in Sarawak west of the Batang Lupar.

Vatica congesta Ashton sp. nov. **Plate 11.**

V. coriaceae Ashton affinis sed petiolo 1.2–2.5 cm. longo, racemis brevibus fasciculatis conferte congestis differt.

Ramuli apices versus gemmae stipulae petiolique conferte breviter pallide ochraceo-fusco-scabrido-tomentosi, lamina subtus costa media basim versus supra sparsim eadem. Ramuli apices versus c. 3 mm. diam. crassi primo angulati rugosi dein fuscenscentes chartaceo-exfoliantes striati; internodis 1–3 cm. longis. Gemmae –4 × 3 mm. late ovoideo-conicae acutae. Stipulae –8 × 3 mm. anguste deltoideae acutae. Lamina 8–22 × 3.5–8 cm. oblongo-elliptica vel obovata coriacea, basi obtusa, margine revoluto, apice subacuminato vel obtuso vel retuso; costis lateralibus utrinsecus 7–12 supra paullum elevatis subtus crassis prominentibus, angulo 40°–55° exorientibus; intercostis subtus prominentibus, supra paullum elevatis reticulatis; costa media supra vix elevatis subtus crassa striata prominenti. Petiolus 1.2–2.5 cm. longus 2–3 mm. diam. crassus sicco rugescens. Inflorescentiae paniculatae –3 cm. longae, stipitis basi in fructu –2 mm. diam., breves axillares vel breviter ochraceo-scabrido-tomentosae semel ramosae; ramulis –1.8 cm. longis flores distichos gerentibus. Alabastrum –8 × 3 mm.

Calyx conferte breviter ocharceo-tomentosis, lobis deltoideis acutis in alabastro expansis; petala lorata conferte pubescentia; aristae breves bifurcatae; stylum breve sericeum; flores aliter ut in *Vaticis* aliis. Pedicellus in fructu –4 mm. longus gracilis. Calyx glaber; lobis longioribus 2, –12 × 2.2 cm. loratis obtusis prominente 3-costatis; lobis brevioribus 3, –4.5 × 1.5 cm. anguste ovatis attenuatis acutis recurvatis. Nux –12 × 8 mm. ellipsoidea glaber apice in stylo –6 mm. longo gracili attentuata.

Collections.—Sarawak: S. 9347A (Holotypus in herb. Kew), 9347 (Yakup), S. 15606, 15713 (Galau), S. 15021, 15045, 14936 (Rosli), Sinclair and Kadim 10219, Semengoh F.R.; S. 15148 (Ilias Paie) Segan F.R., Bintulu.

S. 15148 differs from the Semengoh collections in having 7–8, instead of 10–13, pairs of nerves in the lamina, but shares the large fruit calyx and the short ramiflorous inflorescences, by which this species is so clearly distinguissed from *V. coriacea* Ashton and *V. teysmanniana* Burck (as well as in other leaf character). I therefore have no hesitation in considering it to represent the same species.

V. congesta has been collected in Mixed Dipterocarp forest on leached yellow soils rich in clay, on low hills.

Vatica globosa Ashton sp. nov. **Plate 12.**

Species fructu ut in *V. oblongifolia* Hook. f. sed tomento rufo haud vinoso lamina chartacea subcaudata petiolo brevi ramulo tereti differt.

Ramuli gemmae petiolique persistente rufo-sericei. Ramuli apices versus c. 2 mm. diam. teretes levescentes pallide brunnescentes; internodis –3 cm. longis; cicatricibus stipularibus brevibus horizontalibus obscuris. Gemmae 2 × 2 mm. ovoideae acutae. Stipulae ignotae. Lamina 7–18 × 3–6.5 cm. obovata subchartacea, basi anguste cuneata, apice in acumen –2 cm. longum cuspidatum attenuata; costis lateralibus utrinsecus 13–16 gracilibus subtus prominentibus supra elevatis angulo 35°–60° exorientibus, secundaris multis brevibus; intercostis gracilibus reticulatis; costa media supra subtusque prominenti. Petiolus 7–15 mm. longus c. 2 mm. diam. supra sulcatus. Racemi –3 cm. longi, stipitis basi in fructu –1 mm. diam. terminales vel –3 axillares congesti costati vel teretes persistente rufo-sericei plus minus semel ramosi; bracteolis fugacis. Alabastrum –5 × 2 mm. lanceolatum; calyx externe conferte rufo-pubescens intus glaber; corolla cremia partibus in alabastro expositis rufo-pubescentibus; aristae conicae quam antheras ½-plo longioribus; flores aliter ut in *Vaticis* aliis. Fructus omnibus partibus persistente rufo-sericeis. Pedicellus in fructu –2 mm. longus c. 2 mm. diam. Lobi calycis –4 × 3 mm. aequales oblongi obtusi reflexi. Nux –20 mm. diam. globosi obtusi suturis 3.

Collections.—Sarawak: S. 18091 (Ashton) Ulu Stirau, Labang (Holotypus in herb. Kew); S. 14485 (Brain) Nyabau F.R.; Haviland and Hose 3159, Niah; Haviland and Hose 3148, near Kuching; S. 23751 (Jugah) Bt. Iju, Arip.

This species differs from *V. oblongifolia* Hook. f. both in the rufous, not vinous tomentum, the terete twigs, and the texturally thinner lamina with subcaudate acumen and short petiole. Apart from the single record Haviland and Hose 3148 it is known only from central Sarawak between the Kemena and Niah drainages, where it is locally frequent in Mixed Dipterocarp forest.

Vatica rotata Ashton sp. nov. **Plate 13.**

V. dulitensis Sym. affinis sed lamina late elliptica costis lateralibus utrinsecus 9–11 vix elevatis intercostis conferte reticulatis petiolo 8–12 mm. longo differt.

Ramuli gemmae petioli costa media subtus persistente conferte vinoso-sericei. Ramuli apices versus c. 1 mm. diam. graciles multum ramosi teretes griseo-fuscescentes leves. Gemmae c. 2 × 1 mm. ovoideae subacutae. Stipulae ignotae fugaces. Lamina 5.5–10 × 3–5 cm. late elliptica vel ovata coriacea, basi obtusa, apice in acumen –8 mm. longum attenuata; costis lateralibus utrinsecus 9–11 curvatis vix elevatis angulo 65°–80° exorientibus; intercostis gracilibus conferte reticulatis; costa media supra obscura depressa basi excepta subtus prominentibus. Petiolus 8–12 mm. longus c. 1 mm. diam. gracilis. Flores ignoti. Fructus racemique omnibus partibus persistente plane vinoso-sericei. Racemi –1.5 cm. longi, stipitis basi in fructu c. 1 mm. diam., terminales vel axillares graciles teretes semel ramosi. Pedicellus in fructu –9 mm. longus c. 1 mm. diam. longus gracilis. Lobi calycis in fructu –7 × 4 mm. aequales suborbiculares revoluti rotati. Nux c. 4 mm. diam. subglobosa obtusa suturis 3 obscuris.

Collection.—Sarawak: S. 19594 (Ashton) Ulu Kenyana, Mukah (Holotypus in herb. Kew).

A member of the type section. Though only known from this single collection this species, whose fruit is very similar to that of *V. vinosa* Ashton and *V. dulitensis* Sym., but whose leaf recalls that of *V. borneensis* Burck in sect. *Sunapteae*, is quite distinct from other described species. It was collected in Heath forest.

Vatica rynchocarpa Ashton sp. nov **Plate 14.**

Lamina ut in *V. venulosam* Bl. sed costis lateralibus utrinsecus 10–14 vix elevatis lobi calycis in fructu inaequales longiores 2 ascendentes spatulati.

Ramuli apices versus racemi gemmae stipulae petiolique breviter sparsim griseo-puberulentes, dein glabrescentes. Ramuli apices versus –1 mm. diam. graciles teretes dein levescentes pallide griseo- brunnescentes; internodis –8 mm. longis brevibus. Gemma –1.5 × 1 mm. conica subacuta. Stipula –2.5 mm. longa anguste hastata acuta fugax. Lamina 5–8.5 × 1.3–2.5 cm. anguste elliptica vel lanceolata chartacea; basi obtusa apice in acumen –1 cm. longum angustum attenuata; costis lateralibus utrinsecus 10–14 gracilibus marginem versus curvatis subtus vix elevatis angulo 75°–85° exorientibus remotis, nervis secundariis brevibus; costa media gracili subtus elevata supra paullum depressa. Petiolus –4 mm. longus –1 mm. diam. brevis gracilis sicco nigrescens. Flores ignoti. Racemi –3 cm. longi stipitis basi in fructu –1 mm. diam. terminales vel axillares semel ramosi pallide brunneo-pubescentes. Pedicellus in fructu –7 mm. longus –1 mm. diam. gracilis. Calyx in fructu glaber, lobis basi liberis, longioribus 2, –6.2 × 1.4 cm. chartaceis spathulatis angustis obtusis basim versus –2.5 mm. latis gradatim attenuatis; brevioribus 3, –15 × 2.5 mm. hastatis acutis. Nux –18 × 8 mm. ovoidea glaber stylo –4 mm. longo lineare

Collections.—Sarawak: SA. 514 (Egon) N. Temulan, Rejang (Holotypus in herb. Kepong); S. 16568 (Ashton) Ulu Sinrok, Simalajau F.R.; S. 22047 (Ashton) N. Sepulau, Segan; S. 12107 (Ashton) N. Amau, Mujong. Brunei: Brun. 3354, Ulu Senuko.

This well-defined species is now fairly well known, and is locally common along river banks in Sarawak North-East of the Rejang.

HOPEA

The identity of Hopea laxa Sym.

This species, based on Richards 2361, with flowers, from G. Dulit (Holotype at Kew) was described by Symington (Gard. Bull. S. S. 8 (1934) 33) at a time when only the type of *Hopea pachycarpa* (Heim) Sym., Haviland 2730 with fruit, and one other, at that time unidentified, specimen (S. 512, Merit, Sarawak) has been collected. The type of the latter has, on the evidence of material at present available, smaller leaves with fewer nerves than the average for the species, while in Richards 2361 the reverse is true. There is no doubt, however, that the two are conspecific, Heim's name being the older.

Hopea aequalis Ashton sp. nov. Plate 15.

H. nervosae King affinis, sed lamina basi obtusa costis lateralibus utrinsecus 16–20, lobi calycis in fructu breves subaequales differt.

Costa media supra puberulens, partes aliter glabrae. Ramuli apices versus c. 2 mm. diam. teretes leves pallide fusci: internodis –4 cm. longis; cicatricibus stipularibus brevibus horizontalibus obscuris. Gemma c. 2 × 1 mm. ellpsoidea obtusa. Stipulae ignotae. Lamina 13–25 × 5.5–8 cm. lanceolata chartacea basim versus obtusa apice in acumen –1 cm. longum attenuata; costis lateralibus utrinsecus 16–20 gracilibus subtus prominentibus angulo 65°–70° exorientibus; intercostis conferte scalariformibus gracillimis a nervis diagonale exorentibus; costa media supra subdepressa subtus prominenti gracili. Petiolus 15–18 mm. longus c. 2 mm. diam. sicco niger. Flores ignoti. Racemi –9 cm. longi, stipitis basi in fructu c. 1 mm. dam., axillares teretes glabri non vel semel ramosi. fructu c. 1 mm. diam., axillares teretes glabri haud vel semel ramosi. ovati subacuti saccati incrassati. Nux –23 × 15 mm. ovoidea acuta saepe resinifera.

Collection.—Sarawak: S. 15881 (Ilias Paie) Nyabau F.R. (Holotypus in Herb. Kew). Sabah: SAN. 38797 (Meijer) Mile 80½, Labuk Road trace, Sandakan.

Though founded on but two collections the fruit and leaf characters of this species are sufficiently striking to distinguish it at once from its nearest allies, whch appear to be *H. nervosa* King and *H. sublanceolata* Sym.

Hopea altocollina Ashton sp. nov. **Plate 16.**

H. mengerawan Miq. affinis, sed lamina breviori lanceolata prominente revoluta acumine caudato differt.

Omnes partes glabrae. Ramuli apices versus c. 2 mm. diam. teretes fusci lenticellis parvis pallidis punctati; internodis –2 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma–1 × 1 mm. subglobosa parva. Stipulae ignotae. Lamina 7–10 × 3–4.5 cm. lanceolata prominente revoluta basim versus obtusa apice in acumen –1 cm. longum caudatum attenuata; costis 'dryoblanoideis', costis lateralibus utrinsecus c. 16 obscuris; costis secundariis brevibus; costa media gracili supra subtusque vix elevata. Petiolus 10–13 mm. longus c. 1 mm. diam. subgeniculatus apicem versus subtumescens gracilis sicco niger. Flores ignoti. Racemi –4 cm. longi, stipitis basi in fructu c. 1 mm. diam. terminales vel –2 axillares teretes glabri semel ramosi. Fructus glaber. Pedicellus in fructu –2 mm. longus –1 mm. diam. Lobi calycis in fructu longiores 2, –4.5 × 0.8 cm. spatulati obtusi basim versus –3 mm. lati attenuati, partibus basalibus –6 × 3 mm. anguste ovatis incrassatis saccatis; breviores 3, –4 × 4 mm. suborbiculares obtusi. Nux –7 × 5 mm. ovoidea apice in stylo – 2 mm. longo gracili attenuata.

Collections.—Sarawak: Brun. 1030 (Ashton) Bt. Antu, Ulu Sembayang, Limbang (Holotypus in Herb. Kew); S. 22461 (Sibat) Bt. Mersing, Anap; S. 19618 (Ashton) Carapa Pila, Ulu Mujong; S. 21267 (Ashton) base of Batu Kapal, Mujong; S. 22705, 22706, 22714 (Murthy and Ashton) G. Dulit.

The attenuate apex of th enut suggests that these floral ovary lacks a stylopodium. This species most resembles *H. mengerawan* Miq. of E. Borneo, Sumatra, and Malaya; it differs however in the powdery flaky not ruggedly fissured bark surface, and in the revolute margin of the relatively shorter lamina with its caudate acumen.

H. altocollina is confined to clay rich soils at these altitudinal limits of the Mixed Dipterocarp forests, and has been observed at between 900–1,400 m. It is sometimes an enormous tree, –60 m. tall, –4 m. girth and with tall convex thin spreading plank buttresses.

Hopea andersoni Ashton sp. nov. **Plate 17.**

H. sangal Korth. affinis sed staminibus 15 lamina lanceolato-falcata inaequalis glabra, costis lateralibus remotioribus subtus minus prominentibus differt.

Foliae ramulique glabri. Ramuli apices versus c. 1 mm. diam. teretes leves fusci; internodis –3 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma –1 × 1 mm. subglobosa. Stipulae ignotae. Lamina 5–14 × 2–6 cm. lanceolato-falcata vel elliptica coriacea.

basim versus adaxiale obtusa abaxiale cuneata inaequalis, apice in acumen –2 cm. longum gracile saepe falcatum attenuata; costis lateralibus utrinsecus 9–12 gracilibus subtus vix elevatis curvatis angulo 65°–75° exorientibus saepe domatiis prominentibus pustularibus axillaribus; intercostis scalariformibus; costa media supra vix elevata subtus prominenti. Petiolus 5–10 mm. longus c. 2 mm. diam. sicco niger. Racemi –12 cm. longi, stipitis basi in fructu–1 mm. diam., terminales vel axillares teretes saepe fasciculati conferte plane plus minus persistente pallide griseo-puberulentes; semel ramosi flores –9 secundis gerentibus; bracteolis –2 mm. longis linearibus puberulentibus fugacis. Alabastrum –3 × 2 mm. ellipsoideum. Calyx lobis ovatis acutis subaequalibus externe conferte pubescentibus intus sparsius eisdem. Petala lanceolata partibus in alabastro expositis conferte pubescentibus. Stamina 15 verticillis 3 inaequalibus; filamentis basim versus compressis attenuatis apicem versus filiformibus; antheris late ellipsoideis; aristis gracilibus quam antheras 2–2½-plo longioribus. Ovarium stylopodiumque cylindricum conferte papillosum puberulente, parte media subconstricta, stylopodium quam ovarium paullum angustiore; stylo brevi columellari. Pedicellus in fructu –3 mm. longus c. 1 mm. diam. gracilis. Calyx in fructu basim versus puberulens aliter glabrescens; lobis longioribus 2, –6 × 2 cm. oblongis obtusis basim versus 3 mm. latis attenuatis; partibus basalibus –4 × 3 mm. ellipticis subincrassatis saccatis; lobis brevioribus 3, –4 × 3 mm. ovatis obtusis saccatis. Nux –8 × 5 mm. ovoidea glabra stylopodio parvo truncato styloque c. 1 mm. longo mucronata coronata.

Holotypus: S. 11096 (Anderson) Kuching road, Bau (in Herb. Kew).

Two subspecies are recognised:—

Subsp. andersoni subsp. nov.

Lamina delapsa in sicco rufescens. Cortex nigrescens altis fissis.

Collections.—Sarawak: S. 12238 (Anderson), S. 10038 (Zen), Seburan, Bau; S. 11096, 4639 (Anderson) G. Benarat, Baram; S. 10334, 10352, 10353 (Brunig) Bt. Serapah, Serian road; S. 22865, 22876 (Chai and Lee) Bt. Tabai, Bau; S. 16182 (Chai and Lee) Bt. Kolong, Bau.

Subsp. basalticola subsp. nov.

Lamina delapsa in sicco rava. Cortex fulvescens tenue exfolians.

Collections.—Sabah: SAN. 28649 (Meijer and Baker) Ulu Balong, Tawau; SAN. 23278 (Meijer and Lampangi) Bt. Tingka, Kinabatangan. Sarawak: S. 25005 (Holotypus in Herb. Kew), S. 25040 (Sibat) Bt. Mersing, Anap; S. 23481 (Othman and Suib) Long Kelaby, Ulu Dapoi, Tinjar; S. 22736 (Murthy and Ashton) G. Dulit.

This species is named after Dr. J. A. R. Anderson, in honour of his work on the peat swamp and limestone vegetation of Borneo.

The two subspecies, though only recognisable with experience in the herbarium, are very distinctive in the field owing to their characteristic bark configurations. The type subspecies is an obligatory calcicole, whereas ssp. basalticola appears to be confined to basic intrusive rocks and calcareous shales.

Hopea bullatifolia Ashton sp. nov. **Plate 18.**

Hic species sect. typici subsect. *Pierreae* sedis; lamina bullata subtus badio-pubescenti facile distinguitur.

Gemma stipula externe (intus glaber) petiolus costa media subtusque conferte persistente plane badio-pubescens; lamina costaeque laterales subtus costa media supra sparsim eidem. Ramuli apices versus c. 2 mm. diam. teretes dein leves pallide fusci; internodis –3 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma –1 × 1 mm. parva subglobosa. Stipulae –4 mm. lineares caducae. Lamina 16–34 × 4.5–9 cm. oblonga inter costas prominente bullata, basim versus cordata subaequalis, apice in acumen –1 cm. longum gracile gradatim attenuata; costis lateralibus utrinsecus 17–26 crassis subtus prominentibus supra depressis angulo 35°–45° exorientibus basi excepta prope marginem saepe conjunctis; intercostis scalariformibus subtus prominentibus supra depressis; costa media subtus supraque prominenti. Petiolus 3–6 cm. longus 2–5 mm. diam. brevis crassus. Flores racemique ignoti. Fructus glaber. Lobi longiores calycis in fructu –8 × 1.5 cm. spatulati obtusi basim versus –4 mm. lati attenuati, partibus basalibus –8 × 3 mm. ovatis incrassatis saccatis; lobi breviores 3, –15 mm. longi lanceolati graciles basim versus ut in lobilongiores, nucem obscurantes. Nux c. 10×7 mm. ovoidea apiculata.

Collections.—Sarawak: S. 522 (Mashor) S. Danaw, Rejang (Holotypus in herb. Kew); S. 17730 (Ashton) Ulu Belaga.

A small smooth-barked tree, endemic to Central Sarawak where it is found in scattered groups in the understory of Mixed Dipterocarp forest. It most resembles *H. enicosanthoides* (also described in this paper) but differs in the somewhat smaller leaf with pubescent undersurface and petiole, bullate between the intercostals, drying dark chocolate-brown not pale rust-brown.

Hopea centipeda Ashton sp. nov. **Plate 19.**

—*H. acuminata* (non Merr.) Ashton, Man. Dipt. Brun. (1964) 94.

—*H. acuminatae* Merr. similis, sed ovario stylopodioque pyriformi, costis lateralibus lamina domatiis pubescentibus ornatis differt.

Ramuli apices versus gemmae stipulae petiolus et costis lateralibus subtus plus minus conferte breviter brunneo-tomentosi. Ramuli apices versus –1 mm. diam. horizontale ramosi dein griseo-brunnescentes levescentes glabrescentes lenticellis cremiis parvis orbicularibus punctati; internodis 1–1.5 cm. longi. Gemma –1.5 mm. longa subglobosa. Stipula –3 mm. longa linearis. Lamina 5.5–9 × 1.5–3.5 cm. lanceolata basi inaequali cuneata apice in

acumen –1.5 cm. longum caudatum attenuata; costis lateralibus utrinsecus 7–9 subtus prominentibus paullum curvatis angulo 30°–40° exorientibus domatiis axillaribus pilosis prominentibus; intercostis gracilibus subscalariformibus; costa media subtus prominenti tereta supra angusta depressa. Petiolus 4–7 mm. longus –1 mm. diam. gracilis. Racemi –4 cm. longi, stipitis basi in fructu –0.5 mm. diam. axillares semel ramosi puberulentes. Alabastrum –6 × 2 mm. lanceolatum. Calyx sparisim pubescens, lobis ovatis acutis externis 2 quam interni 3 paullum longioribus. Petala cremia basim versus roseo-suffusa. Stamina 15, verticillis 3 inaequalibus; aristis quam antheras subglobosis c. 3-plo longioribus. Ovarium stylopodiumque pyriforme glabro; stylo stylopodium aequanti. Pedicellus in fructu –1 mm. longus. Calyx in fructu glabrescens, lobis longioribus 2, –2.8 × 0.6 cm. spatulatis obtusis basim versus –1.5 mm. latis attenuatis partibus basalibus –2.5 × 2 mm.; brevioribus 3, –4 mm. longis, basim versus ut in lobis longioribus. Nux –4 × 3 mm. ovoidea glabra apice acuta.

Collections.—Brunei: S. 5750 (Wood, Smythies, Ashton) K. Belalong; Brun 726 (Ashton) K. Sekurop, Temburong. Sarawak: S. 18440 (Ashton) Ulu Tubau, Bintulu; S. 12111 (Ashton) N. Amau, Mujong; S. 19645 (Ashton) N. Sebatang, Mujong; S. 23012, 23011, 23010 (Othman), S. 22682, 22653, 22654, 22655, 23342 (Holotypus in herb. Kew) (Murthy and Ashton) Ulu Dapoi, Tinjar.

I had previously compared this species, owing to its obvious leaf similarities, with *H. acuminata* Merr. of the Phlippines. The latter, however, is hard wooded, with flaky bark, only 10 stamens, and a truncate stylopodium.

Hopea depressinerva Ashton sp. nov. Plate 20.

H. sangal Korth. affinis sed lamina coriaceori costis lateralibus utrinsecus 5–8 sine domatiis differt.

Novelli glabrescentes. Ramuli apices versus 1–2 mm. diam. teretes leves rufo-brunnei; internodis –3 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma –1 × 1 mm. minuta. Stipula ignota. Lamina 5–13 × 2–5 cm. lanceolata vel anguste elliptica coriacea basi cuneata apice in acumen –1.5 cm. longum gracile attenuata; costis lateralibus utrinsecus 6–8 subtus gracilibus elevatis supra paullum depressa, angulo 40°–50° exorientibus; intercostis gracilibus scalariformibus. Petiolus 11–13 mm. longus c. 1 mm. diam. teres sicco nigrescens. Racemi –7 cm. longi stipitis basi –1 mm. diam. teretes terminales vel axillares conferte persistente alutaceo-pubescentes; semel ramosi ramulis –1.5 cm. longis flores –5 secundos gerentibus; bracteolis fugacis ignotis. Alabastrum –3 × 2 mm. ellipsoideum. Calyx conferte alutaceo-sericea lobis ovatis acutis, externis 2 quam internis 3 paullum longioribus angustioribus. Petala externe rosea, intus flavo-rubra elliptica obtusa partibus in alabastro expositis conferte pubescentibus. Stamina 10 aequalia; aristis quam antheras c. 2-plo longioribus filiformibus gracilibus. Ovarium stylopodiumque glabrum cylindricum truncatum stylo brevi coronatum. Fructus maturus ignotus; lobis calycis inaequalibus ut in flores.

Collections.—Sarawak: S. 15439 (Holotypus in herb. Kew), 15516 (Anderson), Bt. Gebong, Lundu; S. 395 (Ariffin) G. Pueh F.R.

This taxon is undoubtedly closely allied to *H. sangal* Korth., but the appearance of the leaf is quite distinct, in many ways recalling that of immature *Shorea maxwelliana* King.

Hopea enicosanthoides Ashton sp. nov. Plate 21.

H. polyalthioides Sym. affinis, sed lamina maiori costis lateralibus utrinsecus 16–30 intercostis conferte scalariformibus differt.

Ramuli gemmae stipulae costa media supra basim versus petiolusque caduce pallide badio-pubescentes vel glabri. Ramuli c. 3 mm. diam. teretes vel subcompressi leves dein fusci sub cicatricibus petiolorum prominente costati; internodis –5 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma –2 × 1 mm. conica acuta. Stipula –8 mm. longa linearis subpersistens. Lamina (16) 27–46 × (5) 8–15 cm. maxima oblonga coriacea facie superiore inter costis lateralibus prominente convexa, basim versus inaequalis cordata, apice in acumen –2.5 cm. longum angustum attenuata; costi lateralibus utrinsecus 16–30 gracilibus subtus prominentibus supra depressis angulo 45°–50° exorientibus; costa media gracili supra elevata subtus crassa prominenti; intercostis conferte scalariformibus gracilimis. Petiolus 5–8 mm. longus c. 3 mm. diam. glaber. Racemi –12 cm. longi stipitis basi in fructu c. 1 mm. diam. brevis crassus sicco niger. Flores ignoti. Racemus fructusque –2 axillares saepe ramiflori teretes laxi semel ramosi; ramulis –3 cm. longi ascendentibus –5 flores gerentibus; bracteolis c. 2 mm. longis linearibus subpersistentibus. Peticellus in fructu c. 1 mm. longus, brevis. Lobi calycis in fructu longiores 2, –13 × 3 cm. plus minus late spatulati obtusi basim versus –6 mm. latus attentuati, partibus basalibus –12 × 10 mm. ovatis saccatis; lobi breviores 2, –2 mm. longi lanceolati acuti, partibus basalibus saccatis vix incrassatis, nucem obscurantibus. Nux –10 × 6 mm. ovoidea stylopodio –2 mm. longo filiformi attenuata.

Collections.—Sarawak: S. 18116 (Ashton) Ulu Labang, Bintulu (Holotypus in herb. Kew); S. 18304 (Ashton) Ulu Sinrok, Similajau F.R.; S. 13200 (Symthies) S. Bena, Baleh; S. 1467, 1470 (Esmit) Miri; s.n. (Anderson) S. Sebakai, Bintulu.

This species, which appears to be widespread though local on alluvium along slow moving non-tidal waterways, is at once distinguished by its huge pendant lustrous leaves, evocative of some of the larger-leaved *Enicosantha* (Anonaceae); they are conspicuously magenta on first opening. *H. enicosanthoides* suffered conspicuously as a result of the unprecedented floods of 1962–63; in the Bintulu drainage in particular a very high proportion of the population died.

Hopea kerangasensis Ashton sp. nov. Plate 22.

Hic species laminis parvis late ovatis costis lateralibus domatiis axillaribus prominenti pubescentibus lobi calycis in fructu ovatis parvis subaequalibus facile distinguitur.

Ramuli apices versus petioli costa media supra domatiae gemmaeque breviter plane plus minus persistente pallide flavido-brunneo-tomentosi. Ramuli apices versus c. 1 mm. diam. multo ramosi teretes dein levescentes brunnescentes internodis 3–8 mm. longis brevibus. Gemma –1 × 1 mm. minuta globosa. Stipula fugax ignota. Lamina 1.5–4.5 × 1–3 cm. parva ovata chartacea basi cuneata apice in acumen –1 cm. longum caudatum attenuata; costis lateralibus utrinsecus c. 6 dryobalanoidiis obscuris; costa media supra paullum depressa subtus gracili prominenti, domatiis utrinsecus –6 magnis pallide fulvo-pubescentibus. Petiolus 3–5 mm. longus c. 1 mm. diam. gracilis. Racemi –12 cm. longi stipitis basi in fructu –0.5 mm. diam. axillares parvi teretes sparsim alutaceo-puberulentes; semel ramosi ramulis –4 mm. longis flores –3 distichos gerentibus; bracteolis minutis linearibus fugacibus. Alabastrum c. 1.5 × 1 mm. ovoideum. Sepala ovata acuminata glabra; interna 3 quam externa 2 breviora apicem versus angustiora media parte latiora. Petala lanceolata partibus in alabastro expositis puberulentibus. Stamina 15 verticillis 3 inaequalibus, antheris subglobosis, aristis quam antheras 2–3-plo longioribus gracilibus. Ovarium ovoideum glabrum; stylo ovarium aequanti columellari attenuata. Fructus ex integro glabra. Peticellus in fructu –1 mm. longus brevis. Lobi calycis in fructu –6 × 5 mm. subaequales ovati acuti saccati incrassati externis 3 quam internis 2 brevioribus angustioribus incrassatioribus. Nux –8 × 5 mm. ovoidea subacuta.

Collections.—Sarawak: S. 15530 (Anderson et al.) S. Serayan, Lundu; S. 15608 (Galau), S. 8944 (Holotypus in herb. Kew), 8912, 8912a (Yakup), S. 21299 (Ashton), S. 14926 (Rosli), Whitmore 446, Semengoh F.R.; S. 9454, 9306 (Bojeng), S. 8932 (Yakup), S. 2274 (Abg. Muas) Setapok F.R.; S. 9669 (Browne) Munggu Unjam F.R.; Haviland $\frac{1030}{857}$ Sadong, coal mine hill.

Haviland 857 was identified by Brandis as *H. vesquei* Heim but the present species, which is locally common in Mixed Dipterocarp forest West of the Batang Lupar, is at once recognised from other members of subsection *Dryobalanoides* by its very small leaves with prominent domatia, as well as by its short subequal calyx lobes.

Hopea longirostrata Ashton sp. nov. Plate 23.

H. beccarianae Burck, *H. dryobalanoides* Miq. affinis sed omnibus partibus glabris pedicello c. 5 mm. longissimo differt.

Omnes partes glabri. Ramuli apices versus c. 2 mm. diam. multo ramosi teretes fusci leves; internodis –1.5 cm. longis, cicatricibus stipularibus brevibus obscuris. Gemma –2 × 2 mm. subglobosa obtusa. Stipula ignota caduca. Lamina 7–9 × 3–5 cm. ovato-elliptica coriacea basi obtusa apice in acumen –1.5 cm. longum subcaudatum attentuata; costis 'dryobalanoidiis'; costis lateralibus utrinsecus c. 12 obscuris haud elevatis; secundariis longis subaequalibus; costa media gracili supra prominenti subtus acuta. Petiolus 7–10 mm. longus c. 1 mm. diam. geniculatus sicco nigrescens. Flores ignoti. Racemus fructusque glaber. Racemi –4 cm. longi stipitis basi in fructu c. 1 mm. diam. terminales vel –3 axillares semel ramosi; ramulis –5 flores gerentibus. Pedicellus c. 5 mm. longus c. 1 mm. diam. Lobi calycis in fructu longiores 2, –24 × 6 mm. spatulati basim versus –3 mm. lati attenuati, partibus basalibus in media parte tuberculatis incrassatis; lobi breviores –15 mm. longi lineares vel spatulati obtusi vel acuti basim versus ut in lobi longiores. Nux –6 × 4 mm. ovoidea stylo –2 mm. longo attenuata.

Collections.—Sarawak: S. 18191 (Ashton) Ulu Tubau, Bintulu; S. 17742 (Ashton) Ulu Belaga, Rejang (Holotypus in herb Kew).

This is a further species in the difficult subsection *Dryobalanoides*. The leaves closely resemble those of several others, including *H. dryobalanoides*, *H. beccariana*, and particularly *H. latifolia* Sym. with which it also shares an overall smooth bark surface. The completely glabrous parts however distinguish it from *H. beccariana* and *H. latifolia*, while the inordinately long fruit pedicel and centrally tuberculate basal portion to the calyx lobes are characteristic and unique in the genus.

H. longirostrata is only known by two collections, though in the area where I collected it the species was fairly common. It may well be more widespread as it is easy to overlook when sterile.

Hopea megacarpa Ashton sp. nov. Plate 24.

H. semicuneatae Sym. affinis sed costis domatiis obscuris lobis calycis in fructu –10 cm. longis basim versus subauriculatis differt.

Ramuli apices versus, costi laminae subtus petiolique sparsim caduce puberulentes, gemmae persistente eaedem. Ramuli apices versus c. 1 mm. diam. graciles teretes leves dein rufo-brunnescentes; internodis –3 cm. longi; cicatricibus stipularibus parvis obscuris. Gemma –1 × 1 mm. minuta. Stipula –2 mm. longa lineare-falcata caduca. Lamina 6–12 × 1.5–5 cm. plus minus anguste elliptica chartacea undulata basi cuneata apice in acumen –2 cm. longum prominenti attenuata; costis lateralibus utringsecus 6–7 gracilibus subtus elevatis angulo 25°–40° exorientibus; intercostis gracilibus conferte scalariformibus; costa media subtus prominenti tereti, supra applanata vel paullum elevata. Petiolus c. 6 mm. longus c. 1 mm. diam. brevis supra striatus sicco nigrescens. Racemi –3 cm. longi stipitis basi in fructu –1 mm. diam. axillares teretes glabri laxi semel ramosi, ramulis flores –3 gerentibus; bracteis bracteolisque –2 mm. longis linearibus subpersistentibus. Alabastrum –4 × 3 mm. subglobosum. Lobi calycis fimbriati, externi 2 ovati, interni 3 suborbiculares submucronati. Petala pallide rosea elliptico-oblonga obtusa partibus in alabastro expositis sparsim puberulentibus. Stamina 15, antheris oblongis; aristis quam antheras c. 3-plo longioribus gracilibus filiformibus. Ovarium stylopodiumque cylindricale subtruncatum glabrum stylo brevi. Fructus ex integro glaber. Pedicellus in fructu –3 mm. longus diamque. Lobi calycis in fructu longiores 2, –10 × 1.3 cm. anguste spatulati subacuti basim versus c. 5 mm. lati attenuati partibus basalibus –9 × 15 mm. subauriculatis saccatis; breviores 3, –20 × 9 mm. ovati basim versus ut in lobi longiores. Nux –12 × 10 mm. ovoidea apice minute truncata mucronata calyce obcura.

Collections.—Sarawak: SFN. 35625 (Daud and Tachun) (Holotypus in Herb. Kew), SA. 639 (Egon) N. Pelagus; S. 14743 (Anderson) Bt. Raya, Pelagus.

This species, only known at present from a very limited area on the middle Rejang, is at once distinguished by its fruit. though the leaves in many ways resemble the widespread *H. semicuneata* Sym.

Hopea mesuoides Ashton sp. nov. **Plate 25.**

H. subalata(*non Sym.*) Man. Dipt. Brun. (1964) 110.

H. subalatae Sym. affinis, sed lamina maiore coriaceore attenuata margine revoluta, lobis calycis in fructu suborbicularibus aequalibus differt.

Gemma stipulaque breviter persistente pallide alutaceo-tomentosa, aliter glaber. Ramuli apices versus –1.5 mm. diam. graciles leves teretes badii; internodis 1.5–3.5 cm. longis. Gemma –1 mm. longa subglobosa. Stipula –2.5 × 1 mm. hastata acuta fugax. Lamina 8–14 × 2.5–5 cm. ovata chartacea basi obtusa apice in acumen –1.5 mm. caudatum gradatim attenuata margine paullum revoluto; costis lateralibus utrinsecus c. 11 subdryobalanoidiis subtus paullum elevatis curvatis angulo 55°–75° exorientibus; costis intermediis brevibus; intercostis reticulatis obscuris; costa media subtus prominenti supra anguste depressa. Petiolus 7–10 mm. longus –1 mm. diam. gracilis sicco nigrescens. Racemi –4 cm. longi, stipitis basi in fructu –0.7 mm. diam. axillares breves glabri semel ramosi, bracteolis –1 mm. longis deltoideis glabris subpersistentibus. Alabastrum parvum late ovoideum. Calyx externe sparsim pubescens, intus glaber, lobis externis 2 suborbicularibus obtusis vel acutis internis 3 suborbicularibus plus minus breviter mucronatis. Corolla purpurea; petalis oblongis obtusis partibus in alabastro expositis pubescentibus. Stamina 15, aristis quam antheras 2–3-plo longioribus gracillimis. Ovarium stylopodiumque glabrum apice papillosa excepta cylindricum truncatum ovarium quam stylopodium paullum latiore; stylo brevi glabro. Pedicellus in fructu c. 1 mm. longum brevis in calyce impressus. Lobi calycis in fructu –14 × 12 mm. subaequales ovati chartacei imbricati saccati ad nucem appressi apices subacutas versus plus minus erosi. Nux –14 × 14 mm. subglobosa glaber stylopodio truncato persistenti coronata calyce obscurata.

Collections.—Sarawak: S. 15551′ (Ilias) Segan F.R. (Holotypus in herb. Kew); S. 11247, s.n., Marudi F.R.; S. 25028 (Sibat) Bt. Mersing, Anap; s.n. (Yakup) Marudi F.R. Brunei: Brun. 91 (Ashton) Mile 3, K. Abang Road; Brun. 879 (Ashton) Bt. Bedawan; Brun. 5674 (Asah) K. Belalong; Kep. 35532, 35536 (Symington)

Pangkalan Ran; Kep. 34451 (Flemmich) Bt. Rampayoh, Labi Hills; Kep. 39639, 48203 (Flemmich) Labi Hills F.R.; Kep. 28657 (Smith) Bt. Kerita, Ladan Hills.

At the time of writing my Brunei Manual only immature fruit were known from Borneo; these appeared to resemble those of the Malayan species exactly though there were differences in the leaf. Mature fruit (in S. 15551) however have confirmed that this taxon should be considered as a separate species.

Hopea pterygota Ashton sp. nov. Plate 26.

H. tenuinervulae Ashton affinis sed lobi calycis in fructu late auriculati lamina intercostis remotioribus.

Novelli primo conferte alutaceo-pubescentes dein glabrescentes gemmis stipulis exceptis. Ramuli apices versus c. 2 mm. diam. fusci dein levescentes glabrescentes; internodis –3 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma –2 × 1 mm. ovoidea acuta. Stipula –4 mm. longa linearis caduca. Lamina 12–28 × 5–9 cm. oblongo-lanceolata vel oblanceolata, basi obtusa vel subcordata inaequalis, apice in acumen –2 cm. longum subcaudatum attenuata, margine subrevoluto, costis lateralibus utrinsecus 12–21 gracilibus subtus prominentibus supra depressis angulo 50°–60° exorientibus curvatis; intercostis gracilibus scalariformibus; costa media supra prominenti subtus prominentiore. Petiolus 3–8 mm. longus c. 2 mm. diam. brevis crassus. Racemi –8 cm. longi stipitis basi in fructu –1 mm. diam. teretes glabri graciles saepe fasciculati axillares saepe ramiflori semel ramosi; ramulis flores –8 secundos gerentibus. Alabastrum –3 × 2 mm. ellipsoideum. Calyx glaber, sepalis externis 2, lanceolatis acuminatis; internis 3, suborbicularibus quam externis 2 paullum brevioribus breviter mucronatis. Petala lineara partibus in alabastro expositis pubescentibus. Stamina 15 verticillis 3 inaequalibus, filamentis basim versus compressis apicibus filiformibus attenuatis; antheris subglobosis; aristis gracilibus quam antheros 3–4 longioribus. Ovarium anguste ovoideum glabrum stylopodio fusiformi quam ovarium paullum breviori. Fructus glaber. Pedicellus in fructu –1 mm. longus –1 mm. diam. brevis. Lobi calycis in fructu longiores 2, –10 × 1.5 cm. spatulati chartacei basim versus –7 mm. lati attenuati, partibus basalibus –20 mm. latis auriculatis in media parte incrassatis; breviores 2, –3 cm. longi subacuti attenuati basim versus ut in lobis longioribus. Nux –7 × 5 mm. ovoidea acuta calyce obscura.

Collections.—Sarawak: s.n. (Anderson) G. Lesong, Simanggang; S. 15206 (Smythies) Bt. Gaharu (Holotypus in Herb. Kew); s.n. (Tready) Marudi; S. 4355 (Dan) Lambir Hills; S. 25022 (Sibat) Anap P.F.; S. 22314 (Suib) Bt. Alet. N. Bah, Rejang; S. 23245, 23612 (Sibat) Bt. Iju, Arip.

This species is most obviously distinguished from its allies *H. tenuinervula* Ashton and *H. philippinensis* Dyer by the broadly auriculate bases to the fruit calyx lobes. In the field it is distinguished by its smooth, not flaky, bark surface and sofe white wood.

H. pterygota is found in Heath forest and sandy ridges in Mixed Dipterocarp forest; though local it is often a very common medium-sized tree where it occurs, as in Marudi F.R. where many trees border the Limbang road.

Hopea tenuivervula Ashton sp. nov. **Plate 27.**

—*H. philippinensis* (non Dyer) Ashton, Man. Dipt. Brun. (1964) 107.

H. philippinensis Dyer similis, sed lamina maiore costis lateralibus subtus utrinsecus 12–16 differt.

Novelli conferte pallide flavido-brunneo-tomentosi, ramuli apices versus gemmae stipulae petiolique persistente tomentosi, costae laminae subtus subpersistente eaedem; aliter tomento caduco. Ramuli apices versus –2 mm. diam. dein levescentes glabrescentes rufo-brunnescentes; internodis 1.5–2.5 cm. longis. Gemma –3 × 1.5 mm. lanceolata. Stipula –5 mm. longa linearis subpersistens. Lamina 10–18 × 3–5.5 cm. anguste ovata vel lanceolata basi obtusa inaequalis apice in acumen –1 cm. longum attenuata; margine paullum revoluto; costis lateralibus utrinsecus 12–16 gracilibus subtus prominentibus angulo 50°–60° exorientibus curvatis; intercostis gracilibus conferte scalariformibus; costa media tereta ex integro elevata. Petiolus 3–7 mm. longus –2.5 mm. diam. brevis crassus. Racemi –8 cm. longi stipitis basi in fructu –1 mm. diam. –2-axillares rare terminales teretes laxi glabri; semel ramosi ramulis –3 cm. longis flores secundos –4 gerentibus; bracteolis –1 mm. longis deltoidiis glabris subpersistentibus. Alabastrum –4 mm. longum ellipsoideum subsessile. Calyx fimbriatus aliter glaber, lobis externis 2 anguste ovatis prominente acuminatis, lobis internis 3, suborbicularibus vel late ovatis mucronatis. Petala oblongo-lanceolata acuta partibus in alabastro expositis conferte tomentosis aliter glabra. Stamina 15; antheris oblongo-ellipsoideis, aristis quam antheras c. 2-plo longioribus gracilibus. Ovarium ovoideum glabrum; stylopodio ovarium aequali fusiformi glabro stigma obscura. Fructus ex integro glaber. Pedicellus in fructu –1 mm. longus brevis. Lobi calycis in fructu longiores 2, –8.5 × 1.7 cm. spatulati anguste obtusi basim versus –2 mm. lati attenuati partibus basalibus –6 × 4 mm. anguste ovatis prominente saccatis incrassatis; lobi breviores 3, –1.3 cm. longi subaequales acuti partibus basalibus –7 mm. longis paullum auriculatis. Nux –12 × 8 mm. ovoidea stylopodio brevi attenuata.

Collections.—Sabah: SAN. 38708 (Mikil) Gaya Island. Brunei: Brun. 619, 3290, 2624 (Ashton) Andulau F.R.; S. 1187 (Brunig) Bt. Teraja; Sarawak: S. 14812 (Rosli), S. 11091, 213 (Abg. Muas), near tree 1154 (Rosli and Asah) Semengoh F.R.; S. 9869 (Anderson) Rantau Panjang, Sibu; S. 12614 (Symthies) Mt. Meroyong, Sempadi F.R.; S. 9616 (Ariffin) Lundu (Holotypus in herb. Kew); Haviland 3167 (Haviland and Hose) near Kuching.

This species, found on leached yellow sandy soils in Mixed Dipterocarp forest, and on deep white sand podsols in Heath forest closely resembles *H. philippinensis* Dyer, but differs, among other characters, in the larger lamina with more abundant nerves.

SHOREA

The identity of Shorea meadiana Sym.

Symington (Gard. Bull. S.S. 10 (1939) 366) based this species on Kep. 49845 (Symington) Bt. Goh F.R. Kuantan, Pahang, a flowering collection. The species is well known in Malaya, and the many collections now extant show no constant differences from the also well collected *S. scrobiculata* Burck of Borneo, whose synonymy I have discussed before (Gard. Bull. Sing. 20 (1963) 272). Symington rightly describes *S. meadiana* as having 28–32 stamens, while Burck describes his species as having 20–30. I have, however found up to 32 in Bornean collections, though none lower than 24. I consequently reduce *S. meadiana* to *S. scrobiculata.*

Collections examined.—Sabah: s.n. (Wyatt-Smith) 5 miles from Dalas, 16.8.54; s.n. (Wyatt-Smith) 5 miles from Dalas, 18.8.54; SAN. 15012 (Wood) Mt. Silam; SAN. 29590 (Aban) Balong, Tawau; SAN. 26895 (Bakar) Bt. Serudong, Tawau; SAN. 25848, 26895 (Meijer) Tawau river F.R.; SAN. 44226 (Pereira) J. Pahudia, Tanjong F.R., Tawau; SAN. 47230 (Meijer) J. Ayer Panas, Tawau; SAN. 25426 (Meijer) Bt. Mesasan, Beluran; SAN. 23135, 26589 (Meijer) Lubuk Buaya, Kinabatangan; Brunei: S. 5572 (Anderson), Brun. 3271, 623, 52 (Ashton), SAN. 17530 (Smythies et al.) Andulau F.R.; Brun. 2606 (Ladi) K. Temburong Machang; S. 2117 (Smythies) Bt. Teraja; S. 5723, 5760 (Smythies et al.) K. Belalong; Brun. 740 (Ashton) K. Sekurop, Ulu Temburong; Brun. 632 (Ashton) Bt. Puan; S. 1952 (?) Bt. Telugong. Sarawak: Kep. 80491 (Wyatt-Smith) S. Dalam F.R.; s.n. (Anderson) Bt. Gondol, Bako N.P.; SFN. 10254 (Sinclair and Kadim) G. Gaharu, Serian; SA. 462 (Majid) Bayor, Lundu, S. 1817 (Hj. Sulong) Bt. Tegarai, Limbang; S. 9441 (Ariffin) Lundu; S. 9923 (Brunig) Bako N.P. (fr. of *Vatica* sp.); Jacobs. 5544, Becc. P.B. 2538, Matang; Becc. P.B. 2889, Sarawak; S. 263, 269 (Sipudin) Nyabau F.R.; S. 1252 (Ariffin) Batang Ayer Betumbok F.R.; S. 2792 (Brunig) Selang F.R.; Malaya: Kep. 50604 (Ismail) S. Nal, Kep. 65760 (Nik Yusoff) Ulu Lebir, Kep. 50507, 50508 (Browne) S. Chalil, Kep. 37976, 37844 (Symington) Tualang Gelam, Kep. 37974 (Symington), Kep. 32820 (Walton) Lata Mak Mik Nol, Kep. 33425 (S.F.O., Kelantan) Bt. P. Lelah, Kep. 33290 (Walton) Pulai Chondong, Kep. 52904, 52902 (Browne), Kep. 38371 (Mohd. Alias) Chebang Tongkat F.R., Kelantan; Kep. 53417 (Ahmad) Kelantan road, mile 37, Besut, Trengganu; Kep. 80850 (Kochummen) 3½ miles from Jerangan police station, Dungun, Kep. 17224 (Debab), Kep. 94918 (Kochummen and Yong), Kep. 49840, 43128 (Symington), Kep. 48042, 47138 (D.F.O., Kuantan), Baloh F.R., Kep. 31751, 31752, 31753, 31761, 31762 (Awan) Jeram, Kep. 49845 (Symington) Dt. Goh F.R.) Kuantan, Pahang; Kep. 34704 (S.F.O., (Kedah) Relau F.R., Kedah; Kep. 51554 (Walton), Kep. 45753, 45754, 45755 (Abd. Taib) Kep. 12973 (Durant) Chikus F.R.; Kep. 29904, 29916, 29942, 29877 (Symington) Bubu F.R.; Kep. 40608 (Symington) Manong, Kep. 33771, 32162, 28969, 33702 (Arnot); Kep. 33685 (Pendak), Kep. 28975 (Tachun and Arnot), Kep. 25442,

21405, 21406, 25885, 25415, 24632, 24519, 24478 (Symington), Kep. 11964 (?) Keledang Saiong F.R., Kep. 24632, 24467, 24470 Tg. Tualang F.R., Perak; Kep. 68950 (Aziz Budin) Forest Research Institute, Kepong, Selangor.

Shorea brunnescens Ashton sp. nov. Plate 28.

S. ciliatae King affinis, sed staminis 40–62 lamina coriaciore intercostis subtus prominentus elevatis.

Gemma conferte breviter persistente alutaceo-pubescens, novellis caduce eisdem, lamina glaber. Ramuli apices versus c. 1 mm. diam. teretes leves nigrescentes; internodis 1–3.5 cm. longis; cicatricibus stipularibus brevibus horizontalibus obscuris. Gemma –2.5 × 2 mm. parva ovoidea acuta. Stipulae ignotae. Lamina 6–12 × 2.5–6 cm. late ovata vel lanceolata coriacea basi cuneata, apice in acumen –1 cm. longum angustum attenuata; costis lateralibus utrinsecus 9–11, gracillimis subtus vix elevatis curvatis angulo 45°–60° exorientibus; intercostis confertis subreticulatis evidentibus vix elevatis; costa media supra obscura depressa subtus prominentibus sulcatis. Petiolus 1–1.5 cm. longus 1–2 mm. diam. sicco nigrescens. Racemi –9 cm. longi stipitis basi in fructu c. 1 mm. diam. terminales vel axillares angulati sparsim breviter pallide alutaceo-pubescens semel ramosi; ramulis –1.5 cm. longis floribus secundis bracteolis ignotis. Alabastrum –4 × 2 mm. anguste ellipsoideum Calyx externe conferte pubescens intus glaber, lobis ovatis acutis internis 2 quam externis 3 paullum brevioribus latioribus. Corolla albida petalis lanceolatis partibus in alabatsro expositis breviter pubescentibus. Stamina 40–62, filamentis glabris basim versus compressis apicibus filiformibus attenuatis; antheris elliptico-oblongis glabris loculis internis 2 quam externis 2 paullum minoribus; aristis quam antheros brevioribus setis longis apicalibus 2 alter glabris. Ovarium stylopodiumque pyriformi conferte pubescenti stylo brevi columellari glabro coronatum. Fructus maturus ignotus. Calyx in fructu dein griseo-sericeus; lobis aliformibus exterioribus 3 quam aliis 2 longioribus. Nux ovoidea conferte breviter pubescens.

Collections.—Sarawak: S. 13179 (Smythies) G. Berumput; S. 15220, 15218 (Holotypus in Herb. Kew) (Smythies) Bt. Gaharu; Jacobs 5544, G. Matang; S. 19373 (Ashton) Bt. Naoung, Muput Kanan, Anap; S. 18194 (Ashton) Ulu Tubau; S. 7995, 10179 (Bojeng) G. Gading; S. 14910, 15019, 14904, 14988, 14928 (Rosli), tree no. 87, 111 (Asah), S. 362 (Omar), S. 45 (Ahmad Kabir), Sinclair and Kadim 10192, S. 15714 (Galau), S. 15773 (Jugah), S. 14931 (Anderson), S. 11057 (Ghazalli), S. 8943, 8945 (Yakup), S. 15172, 15763 (Rosli and Jugah) Semengoh F.R.

This species differs from *S. ciliata* King of Malaya principally in the larger number of stamens, though small but consistent differences in lamina characters are also noticeable. These two species are therefore allied in the same way as *S. sumatrana* (V. Sl. ex Foxw.) Sym. of Sumatra and Malaya is to *S. seminis* (De. Vr.) Sloot of Borneo and the Philippines, *S. lumutensis* Sym. of Malaya is to *S. inappendiculata* Burck of Borneo, and *S. astylosa* Foxw. of the Philippines is to *S. domatiosa* Ashton of Borneo. I have chosen

to consider these as pairs of species rather than as geographical subspecies of single species partially as the range in the number of stamens in each taxon of a pair does not overlap, partially as there are also other, though less clearly defined, differences and partially also in order to avoid upsetting presently accepted nomenclature in the absence of experimental or other conclusive evidence. It appears that a change in the mean number of stamens in separated parts of a population of species in section *Shoreae* is commonly one of the earliest evolutionary divergences to occur. In *S. foxworthyi* Sym. for example the number varies between 33–41 in Malaya and between 32–34 in Borneo; I do not feel this difference is sufficient to merit being given taxonomic status. The 'instability' of this character is not altogether surprising in view of their centrifugal origin.

Though *S. brunnescens* is common in Semengoh F.R. at low altitudes, elsewhere it is confined to hills, being found typically along ridges between 600–1,000 m., in this resembling its Malayan counterpart. The present species is known to me up to the present only from Sarawak, where it is widespread west of the Baram drainage.

Shorea lunduensis Ashton sp. nov. **Plate 29.**

S. collinae Ridl. affinis sed lamina minus coriaceori lobis calycis in fructu inaequalibus longioribus differt.

Ramuli gemmaeque breviter plane fugace pallide alutaceo-pubescentes, laminae glabrae. Ramuli apices versus c. 3 × 2 mm. diam. primo compressi dein nigrescentes nitentes; internodis 1–3.5 cm. longis; cicatricibus stipularibus c. 3 mm. longis pallidis prominentibus ascensis. Gemma –5 × 3 mm. ovoidea acuta niger. Stipulae ignotae. Lamina 14–24 × 6–15 cm. magna ovata vel elliptica basi late cuneata vel subcordata, apice in acumen –1 cm. longo attentuata; costis lateralibus utrinsecus 11–15 supra obscuris subtus prominentibus angulo 40°–55° exorientibus basi excepta intercostis sinuatis conferte scalariformibus; costa media supra vix elevata subtus prominenti. Petiolus 2–3.5 cm. longus c. 2 mm. diam. crassus sicco nigrescens. Racemi –12 cm. longis stipitis basi in fructu –2 mm. diam. terminales vel axillares subteretes conferte breviter fasciculate alutaceo-pubescentes semel vel bis ramosi; ramulis –3 cm. longis; bracteolis –4 × 2 mm. ovatis conferte breviter pubescentibus fugacibus. Flores secundi. Alabastrum –10 × 3 mm. anguste ovoideum calyce expansa. Calyx partibus in alabastro expositis sericeis, lobis anguste ovatis subacutis internis 2 quam exterioribus 3 minoribus latioribus. Corolla cremia, petalis linearibus partibus in alabastro expositis conferte pubescentibus. Stamina 47–52 filamentis compressis attenuatis glabris; antheris oblongis glabris apicem versus attenuatis; aristis quam antheras longioribus conferte setosis. Ovarium stylopodiumque pyriforme conferte pubescente stylo columellari coronatum. Fructus maturus ignotus, novello sparsim breviter pubescens; lobis calycis externis 3, inaequalibus quam internis 2 longioribus spatlats subacutis. Nux apiculo –1 mm. longo attenuata.

Collections.—Sarawak: S. 15396 (Anderson et alia) G. Lundu (Holotypus in Herb. Kew); S.A. 587 (Baharol) S. 10172, 7984, 7968 (Bojeng), s.n. (Anderson), S. 59 (Browne), Gunong Gading F.R.; S. 15502 (Anderson et al.) Bt. Gebong; S. 15482 (Anderson) Bt. Seburan, Bau.

Belonging to the type section and subsection and differing from *S. collina* Ridl. of eastern Malaya principally in the aliform fruit calyx, this species appears to be confined to Mixed Dipterocarp forest in West Sarawak.

Shorea agami Ashton; infraspecific variation.

Two distinct forms of this species (Ashton, Gard. Bull. Sing. 19 (1962) 270), based solely on the size of the lamina, are discernable, and appear to merit subspecific status.

subsp. agami. (Ashton, id. 271, Pl. 9)

Lamina 10–15 × 6–10 cm. late ovata.

Collections (others than those cited in the original description). Sarawak: S. 10077 (Yong) Baram; S. 1454 (Gusni) Miri; S. 1936, 1462 (Dan) Riam road, Miri; S. 1430 (Keram) Bakam, Miri; S. 1489 (Suib) Limbang road, Marudi; S. 1757 (Drahman) Bt. Meringgit, Lawas.

subsp. **diminuta** Ashton subsp. nov. **Plate 30.**

Lamina 4.5–10 × 2.5–4 cm. anguste ovata.

Collections.—Sarawak: S. 25027 (Sibat) Bt. Mersing, Anap (Holotypus in herb. Kew); S. 22335 (Suib) Bt. Leran, Niah; S. 17771 (Ashton), S. 23961 (Wright), S. 23860 (Jugah) Bt. Raya, Kapit; S. 15227 (Jugah) S. Sabal Tapang, Serian.

This latter subspecies is also widespread in western Kalimantan; the ranges of the two subspecies appear not to overlap.

Shorea cordata Ashton sp. nov. Plate 31.

S. hypochrae Hance affinis sed lamina maiore haud lepidota basim versus cordata.

Ramuli apices versus petioli conferte, lamina costis lateralibus subtus sparsim caduce pubescentes, gemmae stipulaeque persistente pubescentes. Ramuli apices versus c. 3 × 2 mm. diam., paullum compressi fuscescentes terescentes levescentes vel ruguli; internodis –5 cm. longis; cicatricibus stipularibus horizontalibus latis pallidis prominentibus. Gemma –7 × 4 mm. ellipsoidea compressa acuta. Stipula –12 × 6 mm. elliptica obtusa. Lamina 8–15 × 5.5–10.5 cm. oblonga vel obovata, basi cordata vel rare acuta, apice obtusa vel retusa vel in acumen –8 mm. longum abrupte attenuata; costis lateralibus utrinsecus 15–18 subtus prominentibus apicem versus angulo 30°–40° basim versus angulo –100° exorientibus; intercostis gracilibus conferte scalariformibus; costa media supra depressa subtus prominenti. Petiolus 13–25 mm. longus c. 2 mm. diam. teres saepe rugulosus sicco nigrescens.

Racemi –12 cm. longi stipitis basi in fructu –2 mm. diam. terminales vel axillares laxi compressi vel costati persistente alutaceo-puberulentes semel ramosi; ramulis –5 cm. longis –5 flores plus minus secundis gerentibus; bracteis –10 × 3 mm. lanceolatis acutis puberulentibus fugacibus; bracteolis –10 × 5 mm. ellipticis obtusis puberulentibus subpersistentibus. Alabastrum –10 × 5 mm. fusiforme. Calyx externe sericeus, intus glaber; lobis anguste deltoideo-lanceolatis obtusis exterioribus 3 quam interioribus 2 paullum maioribus. Petala oblongo-lanceolata externe sericea intus glabra. Stamina 15 verticillis 3 inaequalibus vel externis 10 vestigialibus; filamentis angustis compressis attenuatis; antheris elliptico-oblongis; aristis quam antheras –6-plo longoribus filiformibus atenuatis. Ovarium ovoideum glabrum, stylo columellari quam ovarium 2-plo longiore attenuato basim versus sericeo apicem versus obscure trifurcato. Fructus glaber. Pedicellus in fructu obscurus in calycem decurrens. Lobi calycis longiores 3, –13 × 2.5 cm. lorati obtusi basim versus –8 mm. lati attenuati, partibus basalibus –12 × 12 mm. orbicularibus incrassatis saccatis; lobi breviores 2, –6.5 × 0.8 cm. angusti lanceolati acuti, basim versus ut in lobi longiores. Nux –14 × 10 mm. globosa calyce obscurata.

Collections.—Sarawak: S. 13183 (Smythies) G. Berumput; SA. 678 (Egon) outside Semengoh F.R. (Holotypus in Herb. Kew); S. 7988, 7986, 10177 (Bojeng) G. Gading; S. 19306 (Ashton) Ulu Mayeng, Kakus.

Apparently allied to *S. hypochra* Hance of Malaya, Thailand, Cambodia and Cochin China, *S. cordata* differs mainly in the larger cordate glabrescent lamina lacking the characteristic pale yellowish lepidote undersurface of the former species; in this it resembles immature specimens of *S. hypochra*. *S. cordata* is a rare tree, found to date in Central and West Sarawak; it can be of immense size.

Shorea polyandra Ashton sp. nov. **Plate 32.**

Ramuli petioli lamina subtusque persistente rufo-lepidoti, gemmae stipulaeque persistente breviter rufo-puberulentes. Ramuli apices versus c. 1 mm. diam. graciles teretes griseo-fuscescentes leves vel minute striati; internodis –2 cm. longis; cicatricibus stipularibus brevibus horizontalibus obscuris. Gemma –2 × 1 mm. parva ellipsoidea subacuta. Stipula –5 × 2 mm. lanceolata subacuta fugax. Lamina 8–13 × 3–5 cm. lanceolata chartacea undulata basi cuneata apice in acumen –2 cm. longum gracile gradatim attenuata; costis lateralibus utrinsecus 11–14 gracilibus subtus elevatus angulo 40°–60° exorientibus; intercostis scalariformibus gracilibus; costa media gracili supra applanata subtus prominenti. Petiolus 14–20 mm. longus c. 1 mm. diam. gracilis. Racemi –6 cm. longi, stipitis basi in fructu –2 mm. diam., terminales vel axillares teretes conferte rufo-pubescentes semel ramosi; ramulis –1 cm. longis flores –3 plus minus distichos gerentibus; bracteolis –4 × 3 mm. ellipticis subacutis rufo-pubescentibus caducis. Alabastrum –5 × 4 mm. late ovoideum. Calyx partibus in alabastro expositis seriuces, lobis suborbicularibus subaequalibus. Petalae oblongae obtusae partibus in alabastro expositis conferte pubescentibus. Stamina 102–107 plurima subaequalia; filamentis basim versus compressis apicem versus attenuatis; antheris quam filamentos –2-plo longioribus anguste oblongis loculis 2; aristis filiformibus attenuatis quam antheris paullum brevioribus conferte setosis. Ovarium ovoideum conferte pubescente stylo brevi late columellari trifurcato pubescenti apice excepto attenuatum. Pedicellus in fructu –1 mm. longus –2 mm. diam. brevis. Calyx in fructu basim versus sparsim rufo-pubescens glabrescens; lobis longioribus 3, –8 × 1.4 cm. spatulatis obtusis vel subacutis basim versus –8 mm. latis attentuatis partibus basalibus –10 × 8 mm. tuberculatis saccatis incassatis; brevioribus 2, –5 × 0.5 cm. linearibus acutis basim versus ut in lobis longioribus. Nux –30 × 13 mm. anguste ovoidea acuta conferte rufo-pubescens.

Collections.—Sarawak: S. 10171 (Holotypus in herb. Kew) 10174, 10189, 7977, 7979 (Bojeng) G. Gading F.R. Sabah: SAN. A3959, A3465, 15265 (Wood) Kalabakan, Tawau; SAN. 16478 (Wood) Quoin Hill, Tawau; SAN. 16342 (Wood and Kapis) Pangi, Tenom. Kalimantan: Kostermans 13302, Mt. Medadam, N. of Sengkulirang; b.b. 21976 (Zwaan), 21974, 21975 (Henar) Djalepat, P. Laut; b.b. 31167, 27186 (Chatihoe) Seblimbingan, P. Laut; b.b. 31559 (Kadiri), 12345 (Zwaan), 12901 (Hildebrand) Sei Paring, P. Laut; b.b. 25158 (Soeli), b.b. 26404, 26405, 26406 (Lammers) Tg. Miri, P. Laut; b.b. 12239 (Ramli) Sei Taip, P. Laut; b.b. 23888 (Henar) Seratah, P. Laut; b.b. 20165 (Mahboel) Batoeng, Kandangan; b.b. 20455 (Nandika) Petarikan, Kota Waringin; b.b. 23349, 23350, 23351 (Dachlan) Sakadoea, Martapoera; b.b. 23353 (Dachlan) Taha Doea, Martapoera; b.b. 14629 (Pohan) Katak, E. Kutei; b.b. 17557 (Atjil) Sotek, Balikpapan; b.b. 15758, 15777, 15779 (Hamid) Sebulu, W. Kutei; b.b. 26050 (Soepomo) Mendan, W. Kutei; b.b. 23080, 23081 (Dijen) G. Karap, W. Kutei; b.b. 23072 (Dijen) Lebak Njur, W. Kutei; b.b. 22937 (Nandika) Benua Baru, W. Kutei; b.b. 2049 (de Jong) Pait, W. Borneo; b.b. 22882, 22610 (Walinjan) Bt. Rompin, Sintang; b.b. 25100, 25101, 25099 (Budding) Tjatit B. Tengkoejoeng, Malawi.

This striking species is in fruit very similar to *S. gibbosa* Brandis and *S. faguetiana* Heim, but the flowers are so different from other numbers of Section *Richetioides* that it justifies the creation of a new infrageneric group to contain it. The anthers, though shaped as in Section *Anthoshoreae* are yet 2-locular, a character unique to Section *Richetioides.* In wood anatomy too Gottwald considers it to be typical of the latter section (in litt.), though Murthy tells me that there are small differences, as follows.

Character	*Typical sect. Richetioides*	*S. polyandra*
Silica	Absent	Absent, but presence of crystals in rays very much like silica distribution.
Calcium oxalate crystals	Present but not abundant	Abundant
Rays canals	Fairly common	Rare, though present.
Chambered crystals in paranchyma	Frequent, alawys present	Rare.

I therefore consider that it merits the creation of a new subsection within Section *Richetioides* rather than a separate section altogether. The description of Section *Richetiodes* thus needs further amplification.

Section Richetioides Heim.

Type: **S. faguetiana** Heim.

Anthers with 2 pollen sacs; appendage to connective erect, filiform, more or less scabrous or setose. Style shorter than ovary. Stipules and bracts minute, fugaceous; lamina nervation usually more or less reticulate, pellucid, midrib raised or sunken above, evident.

Subsection 1. **Richetioides.**

Flowers usually small, bud fusiform; stamens 15 (rarely 10), in 3 verticils; filaments broad at base, frequently gibbous, tapering more or less abruptly medially, filiform below anther; anthers broadly oblong to subglobose; appendage to connective longer than anther, more or less scabrous towards apex; ovary with stylopodium, shortly tomentose, with a slender columnar style.

Subsection 2. **Polyandrae** Ashton, subsect. nov.

Type: S. **polyandra** Ashton

Alabastrum –5×4 mm. magnum late ovoideum. Staminal 8, sine verticillis; filamentis basim versus compressis apicem versus gradatim atenuatis; antheris anguste oblongis; aristis quam antheras paullum brevioribus conferte setosis. Ovarium ovoideum sine stylopodio conferte longe pubescente stylo brevi lato prominenti trifurcato.

Shorea alutacea Ashton sp. nov. Plate 33.

S. gibbosae Brandis, *S. faguetianae* Heim affinis sed lamina maiore costis lateralibus utrinsecus 14–19 petiolo 6–10 mm. longo breviore costa media subtus petiolo ramulique conferte persistente plane pallide ochraceo-pubescentibus.

Ramuli stipulae gemmae petioli costae mediaeque breviter conferte persistente alutaceo-pubescentes, lamina subtus sparsim eaedem. Ramuli apices versus c. 2 mm. diam. teretes; internodis 1–4.5 cm. longis; cicatricibus stipularibus c. 1.5 mm. longis horizontalibus. Gemma c. 2 × 1.5 mm. ovoidea acuta parva. Stipula –8 × 3 mm. anguste deltoidea acuta magna. Lamina 15–22 × 6–8 cm. ovata vel lanceolata undulata chartacea basi cordata apice in acumen –1 cm. longum attenuata; costis lateralibus utrinsecus 14–19 curvatis gracilibus supra anguste depressis subtus prominentibus basim versus angulo –100° apicem versus angulo 60°–70° exorientibus; intercostis subscalariformis gracilibus obscuris; costa media supra depressa subtus prominenti tereti. Petiolus 6–10 mm. longus c. 2 mm. diam. sicco rugosus. Racemi –15 cm. longi, stipitis basi in fructu –2 mm. diam. terminales vel axillares teretes recti conferte breviter pallide alutaceo-pubescentes semel vel bis ramosi; ramulis –2.5 cm. longis; bracteolis –4 × 3 mm.

ovatis acutis conferte breviter alutaceo-pubescentibus fugacibus. Flores secundi. Alabastrum –6 × 3 mm. ellipsoideum magnum. Calyx partibus in alabastro expositis conferte pubescentibus, lobis late ovatis subaequalibus internis 2 breviter acuminatis quam externis 3 marginem versus characeoribus basim versus angustioribus. Petala lanceolata badia partibus in albastro expositis pubescentibus, statu aperto basim versus imbricatis apicem versus contortis. Stamina 15, verticillis 3 inaequabibus; filamentis basim versus latis compressis attenuatis apicem versus filiformibus; antheris late oblongis loculis 2; aristis quam antheros 3–4-plo longioribus gracilibus glabris. Ovarium stylopodiumque pyriforme conferte pubescente stylo columellari glabro attenuatum; stylo stylopodium aequanti. Pedicellus calyxque in fructu sparsim breviter caduce pubescens. Pedicellus c. 1 mm. longus brevis. Lobi calycis longiores 3, –8 × 1.8 cm. spatulati basim versus –4 mm. lati attenuati, partibus basalibus –7 × 7 mm. ovatis saccatis incrassatis; lobis brevioribus 2, –6 × 1.2 cm. alter ut in lobis longioribus. Nux –2.2 × 1 cm. anguste ovoidea conferte breviter plane alutaceo-tomentosa apiculo brevi attenuata.

Collections.—Sarawak: S. 7976, 7975, 10170 (Holotypus in Herb. Kew) (Bojeng) Gunong Gading F.R.

A member of section *Richetioides* Heim and allied to *S. faguetiana* Heim and *S. gibbosa* Brandis among others, the lamina differences quoted in the preceding diagnosis serve at once to distinguish it.

S. alutacea is known at present only on the granodiorite Gading mountains of West Sarawak, where it is scattered below 400 m. alt.

Shorea bakoensis Ashton sp. nov. Plate 34.

S. laxa Sloot. affinis, sed lamina oblongo-lanceolata basi obtusa, petiolo 10–12 mm. longo c. 2 mm. diam., lamina petiolo ramuloque glabro differt.

Laminae petioli ramulique glaber. Ramuli apices versus c. 2 mm. diam. primo leves pallide fusci lenticellis nigris punctati dein fuscentes exfoliati; internodis c. 1.5 cm. longis; cicatricibus stipularibus brevibus horizontalibus. Stipula gemmaque ignota. Lamina 13–18 × 5–6 cm. anguste oblonga vel lanceolata coriacea basi obtusa apice in acumen –1 cm. longum angustum attenuata; costis lateralibus utrinsecus 9–10 curvatis subtus prominentibus angulo 55°–65° exorientibus; intercostis gracilibus subtus vix elevatis subscalariformibus; costa supra applanata subtus prominenti. Petiolus 10–12 mm. longus c. 2 mm. diam. brevis crassus sicco niger. Flores racemique ignoti. Peticellus in fructu brevis obscurus. Lobi calycis –4 × 3 mm. subaequales oblongi obtusi incrassati saccati patentes externe sparsim persistente alutaceo-sericei. Nux –25 × 14 mm. ellipsoideo-cylindrica conferte plane persistente alutaceo-pubescens apice in stylum –1 mm. longum attenuata.

Collections.—Sarawak: S. 17502 (Brunig) Bako National Park (Holotypus in Herb. Kew).

This rare species is only known from a few localities in W. Sarawak. It somewhat resembles *S. laxa* Sloot. and *S. obovoidea* V. Sl., but differs in the glabrous leaf wth obtuse base and relatively shorter petole, as well as in the ellpsoid — cylindric, not obovoid, nut.

Shorea Cuspidata sp. nov. **Plate 35.**

S. gibbosa Brandis, *S. faguetana* Heim. affinis, sed lamina 5–9 × 2–6 cm. minori glabra costis lateralibus utrinsecus 5–7.

Gemma stipulaque breviter persistente pubescens, ramulus caduce pubescens, lamina glaber. Ramuli apices versus c. 1 mm. diam. graciles teretes fusci minute striati; internodis 1–2.5 cm. longis. Gemmae c. 1 mm. longae parvae ovoideae. Stipulae parvae fugaces. Lamina 5–9 × 2–6 cm. late ovata subcoriacea basi cuneata apice in acumen –1.5 cm. longum subcaudatum attenuata; costis lateralibus utrinsecus 5–7 gracilibus subtus vix elevatis curvatis angulo 40°–50° exorientibus; intercostis reticulatis obscuris; costa media gracili supra applanata vel paullum elevata subtus prominenti. Petiolus 7–11 mm. longus c. 1 mm. diam. gracilis sicco niger. Racemi –9 cm. longi, stpitis basi in fructu –1.5 mm. diam., terminales vel axillares teretes graciles conferte plane breviter alutaceo-pubescentes semel ramosi; ramulis –1.5 cm. longis flores secundos gerentibus. Alabastra –3 × 2 mm. parva ellipsoidea. Calyx partibus in alabastro expositis pubescentibus sepalis late ovatis parvis subaequalibus acutis, internis 2 quam externis 3 latioribus marginem versus chartaceoribus. Petala pallide lutea lanceolata prominente contorta partibus in alabastro expositis conferte pubescentibus basibus connatis. Stamina 15, verticillis 3 inaequalibus; filamentis basim versus compressis apicem versus filiformibus attenuatis; antheris loculis 2 ellipsoideis; aristis quam antheras c. 1½-plo longioribus gracilibus dimidiis apicalibus pubescentibus. Ovarium stylopodiumque pyriforme sericeum stylo brevi columellari glabro coronatum. Pedicellus calyxque in fructu breviter sparsim pubescens. Pedicellus c. 1 mm. longus brevis. Lobi calycis longiores 3, –5 × 1.5 cm. late spatulati obtusi basim versus –3 mm. lati attenuati; partibus basalibus –5 mm. latis saccatis incrassatis; lobis brevioribus 2, –4 × 1 cm. aliter ut in lobis longioribus. Nux –2.5 × 1.5 cm. obovoidea conferte breviter plane alutaceo-pubescens in apice mucronata attenuata.

Collections.—Sarawak: S. 15258 (Holotypus in Herb. Kew), 15715 (Galau), S. 9345, 9345A (Yacup), S. 11056 (Ghazalli), S. 15179 (Rosli and Jugah), S. 14999, 15718 (Rosli), Tree No. 603 (Asah), S. 10033 (Zen) Semengoh F.R.; S. 15211 (Smythies) Bt. Gaharu; S. 9607, 9609, 9615 (Ariffin) G. Tamin, Lundu; S. 6513 (Yakup) Gunong Tabut, Ulu Sebuyau; S. 9483, 9487, 9487A (Saidi) Santubong; S. 364 (Ariffin) Bt. Sebandar, Lundu; S. 10289, 10289A (Ardzi) Bako N.P.

This species is allied to *S. faguetiana* Heim and *S. gibbosa* Brandis in section *Richetioides* Heim, but differs in the fewer nerves, glabrous leaf and smaller size of all parts. Furthermore the bark surface configuration appears to be unique in the section: at first smooth, chocolate-brown with grey lichen-mottling; becoming regularly surface-fissured, fissures –8 mm. broad, –4 mm. deep, V-section, anastomosing, separated by short sharp zig-zag ridges; ridges flaking evenly in small oblong pieces leaving an overall smooth tawny prominently scroll-marked surface beneath; in old trees further flaking irregularly. This surface-fissure configuration evokes that of *Shorea biawak* Ashton of section *Shoreae* subsection *Barbatae* Sym. ex Ashton (see my Manual of the Dipterocarp Trees of Brunei State, p. 129, pl. 37), but in that species the flaking is chunky and bears no relation to the surface fissuring.

S. cuspidata formerly bore the code-letter names *Shorea* H_4, *Shorea* K_4, and *Shorea* Z_3. It is found on yellow sandy soils in Mixed Dipterocarp forest. It is widespread in Sarawak west of the Lupar, and is frequently the most abundant representative of the section.

Shorea iliasii Ashton sp. nov. **Plate 36.**

Species lamina ut in *S. faguetiana* Heim, sed 19–25 × 9–12 cm. maiore costis lateralibus utrinsecus 12–14 petiolo 22–30 mm. longo c. 3 mm. diam. differt.

Novelli caduce griseo-sericei. Ramuli apices versus c. 2 mm. diam. teretes griseo-fusci saepe chartaceo-exfoliati; internodis –4 cm. longis; cicatricibus stipularibus brevibus horizontalibus. Gemma stipulaque ignota. Lamina 19–25 × 9–12 cm. oblongo-ovata, basi obtusa sed breviter decurrenti subaequali, apice in acumen –8 mm. longum breve attenuata; costis lateralibus utrinsecus 12–14 curvatis subtus prominentibus angulo 50°–75° exorientibus; intercostis remote scalariformibus; costa media supra applanata vel paullum elevata subtus prominenti. Petiolus 22–30 mm. longus c. 3 mm. diam. crassus teres sicco nigrescens. Racemi –10 cm. longi, stipitis basi in fructu c. 3 mm. diam., teretes caduce griseo-sericei. Alabastrum –4 × 2 mm. parvum fusiforme. Calyx partibus in alabastro expositis conferte puberulentibus, lobis externis 3 ovatis acutis internis 2 quam externis minoribus breviter fimbriatis basim versus angustioribus. Petala cremia lineara obtusa partibus in alabastro expositis conferte pubescentibus. Stamina 15 verticillis 2 inaequalibus, internis 5 quam aliis paullum longioribus, filamentis basim versus latis sub antheris subglobosis filiformibus attenuatis; aristis quam antheras c. 1½-plo longioribus apices versus sericeis. Ovarium anguste ovoideum pubescente stylo brevi glabro attenuatum. Calyx basim versus sparsim griseo-sericeus, aliter glaber; lobis longioribus 3, –8 × 2.2 cm. spatulatis obtusis vel subacutis basim versus –4 mm. latis attenuatis; partibus basalibus –6 × 5 mm. saccatis incrassatis prominenti tuberculatis; lobis brevioribus 2, –5.5 × 1.2 cm. aliter ut in lobis longioribus. Nux –10 × 8 mm. ovoidea acuta conferte persistente griseo-sericea.

Collections.—Sarawak: S. 15102 (Ilias) Ulu Segan, Bintulu (Holotypus in herb. Kew); SA. 310 (Spurway) Long Sangga, Baram; S. 1455 (Brunig) Ulu Skroh, Kapit; S. 15842 (Ilias and

Johnson) Similajau F.R., Labang; S. 22063, 22041 (Ashton) N. Sepulau, Segan; S. 22258, 22259 (Suib) Bt. Raya; S. 22304 (Suib) Bt. Wong, Pelagus.

Differing from *S. faguetiana* Heim in the larger size of all parts and the greater number of lamina nerves, this species is known so far from the Lower Rejang to the Kemena drainage in Central Sarawak.

Shorea macrobalanos Ashton sp. nov. **Plate 37.**

S. longiflorae (Brandis) Sym. affinis, sed lamina 19–37 × 8–15 cm. latiore nervis angulis 45°–65° exorientibus basi excepta petiolo 1.8–3.7 cm. longo differt.

Gemma stipulaque persistente alutaceo-pubescens aliter glaber. Ramuli apices versus c. 4 mm. diam. primo teretes dein verrucosi pallide alutacei; internodis –7 cm. longis; cicatricibus stipularibus c. 3 mm. longis obscuris ascendentibus. Gemma –2 × 2 mm. ovoidea acuta. Stipula ignota. Lamina 19–37 × 8–15 cm. oblonga coriacea, margine revoluto, basi cordata, apice in acumen brevi abrupte attenuata vel obtusa; nervis utrinsecus 12–16 subtus prominentibus angulo 45–°65° exorientibus basi excepta; intercostis gracilibus remote subreticulatis; costa media supra applanata subtus prominenti. Petiolus 1.8–3.8 cm. longus c. 4 mm. diam. sicco nigrescens. Flores ignoti. Racemi –32 cm. longi, basi stipitis in fructu –5 mm. diam., longi terminales vel axillares paullum compressi glabri pallide fusci rugescentes semel vel bis ramosi. Fructus sessilis glaber; lobis calycis –8 × 8 mm. subaequalibus ovatis saepe marginem versus undulatis expansis. Receptaculum –1 cm. diam. –8 mm. longum magnum. Nux –5 × 2.5 cm. magna oblonga breviter apiculata.

Collections.—Sarawak: S. 13192 (Smythies) G. Berumput (Holotypus in Herb. Kew); S. 10324 (Brunig), S. 11726 (Hj. Bujang) Semengoh F.R.; S. 13712 (Ilias Paie) G. Pueh.

Undoubtedly closely allied to *Shorea longiflora* (Brandis Sym. of Section *Richetioides* Heim, this West Sarawak species differs in the relatively longer petiole, relatively broader lamina and larger parts generally, and in the much larger size the tree attains.

Shorea mujongensis sp. nov. **Plate 38.**

S. gibbosae Brandis affinis sed lamina maiore subtus glabra margine prominente revoluto petiolo glabrescenti differt.

Ramuli apices versus gemmae petiolique breviter alutaceo-pubescentes dein glabrescentes. Ramuli apices versus c. 2 mm. diam. teretes ruguli lenticellis pallidis minutis punctati; internodis –3 cm. longis; cicatricibus stipularibus brevibus obscuris. Gemma –2 × 1 mm. conica. Stipula ignota. Lamina 7–14 × 2.8–5.5 cm. ovata margine revoluto basi obtusa vel late cuneata, apice in acumen –8 mm. longum attenuata; costis lateralibus utrinsecus 9–13 gracilibus subtus prominentibus curvatis angulo c. 50° exorientibus; intercostis scalariformibus obscuris haud elevatis; costa media supra applanata subtus prominente tereta. Petiolus 10–16 mm.

longus c. 2 mm. diam. teres sicco nigrescens. Flores ignoti. Racemi –6 cm. longi, stipitis basi –2 mm. diam. semel ramosi teretes ruguli breviter plane alutaceo-pubescentes. Pedicellus in fructu –2 mm. longus –1 mm. diam. puberulens. Calyx in fructu sparsim puberulens dein glabrescens; lobis longioribus 3, –7 × 1.5 cm. spatulatis obtusis basim versus c. 4 mm. latis attenuatis partibus basalibus –6 × 5 mm. tuberculatis incrassatis; lobis brevioribus 2, –4.5 × 0.7 cm. aliter ut in lobis longioribus. Nux –2.2 × 0.7 cm. anguste ovoidea conferte breviter pallide alutaceo-pubescens.

Collections.—Sarawak: S. 19038 (Ashton) Base of Bt. Temedu, Hose Mountains (Holotypus in Herb. Kew); S. 19993, 19603 (Ashton) Carapa Pila.

At present this magnificent tree is known only from the inaccessible woods on the middle slopes of the Hose mountains. The lustrous leaves make its pale crown easily identifiable in aerial photographs.

Shorea hemsleyana King ex Foxw., Mal. For. Rec. 10 (1932) 167: Notes on infraspecific variation.

Symington (Gard. Bull. S.S. 7 (1933) 129) revised the nomenclature and synonymy of this Malayan species. He reduced *Shorea grandiflora* Brandis (J. Linn. Soc. Bot. 31 (1895) 93) to it, based on Haviland 2121, with flowers and fruits, from the Kuching area of Sarawak. Until recently this remained the only Bornean collection; but now that more material has been collected from Borneo it has become apparent that the type specimen of *S. grandiflora* bears leaves and twigs larger than they are on mature trees of this species in Borneo, inferring that it was collected from an immature specimen. These parts are considerably smaller than is normal for the species in Malaya, and justify the Bornean form's resurrection as a separate subspecies:

ssp. hemsleyana

Lamina 14–35 × 6–15 cm. Petiolus 1.4–2 cm. longus. Racemus –25 cm. longus.

Collections examined.—Malaya: Kunstler 6670, 7562, Larut Perak, Scortechini 1653, Perak (Syntypes); Curtis 2512, 3739, Province Wellesley; Kep. 16814, Lumut F.R.; Dindings; Kep 75983, 80220, Kepong plantations; Kep. 16826, Bruas F.R., Dindings; Kep. 12018, Parit F.R., Tronoh, Perak.

ssp. grandiflora (Brandis) Ashton, stat. nov.

—*S. grandiflora* Brandis, J. Linn. Soc. Bot. 31 (1859) 93.

Omnes partes ut in *ssp. hemsleyana* sed lamina 10–23 × 4–11 cm., petiolo 6–12 mm. longo, racemis –4 cm. longis differt.

Collections.—Sarawak: Haviland 2121, near Kuching (Holotypus in herb. Kew); S. 18860 (Ashton), S. 12612 (Smythies) Bt. Meroyong, Sempadi F.R., Lundu; S. 6503 (Yakup) G. Menuku, Sebuyau (fruit excepted); S. 21585 (Ashton) G. Matang; S. 22333 (Suib) Bt. Leran, Niah; S. 6236 (Brunig) G. Pueh F.R.

The identity of Shorea johorensis Foxw.

This species was described (Mal. For. Rec. 10 (1932) 236) from a single specimen, Kep. 5992 (Bain) Gunong Panti, Johore, now in the Kew herbarium. It bears somewhat immature fruits. Symington (Mal. For. Rec. 16 (1943) 72) regarded it as a dubious species, tentatively synonymous with *S. singkawang* Miq., notwithstanding that species has vestigial fruit calyx lobes, whereas the fruit of Kep. 5992 is prominently winged.

The material of *S. singkawang* now available shows that the fruit of Kep. 5992 is definitely not of this species; though it is detached, Foxworthy's photograph of the fresh material with attached fruits is clear enough to be unequivocal. Kep. 5992 is however identical with Kep. 35758 and 35759, from the same locality, cited by Symington in his original description of *S. leptoclados* (Gard. Bull. S.S. 10 (1939) 376). The Holotype of *S. leptoclados,* Kep. 30533 (Smith) Batu Apoi, Brunei in the Kepong herbarium, differs, as does most, but not in fact all, Bornean material, from Malayan material in possessing 3–6 pairs of pale scale-like domatia in the axils of the first 3–6 pairs of basal nerves. This, the only difference, is not only small but inconstant, and I feel compelled, therefore to reduce *S. leptoclados* to Foxworthy's species.

Shorea uliginosa Foxw. reinstated.

This species was described (Mal. For. Rec. 10 (1932) 210) from Kep. 7938 (Foxworthy) Bukit Cheraka F.R., Selangor, a flowering collection, represented both at Kepong and Kew. Symington (Gard. Bull. S.S. 10 (1939) 372) reduced it to a variety of *S. rugosa* Heim, stating that '*S. uliginosa* has slightly larger leaves with relatively longer petioles, and smaller, less hairy fruits'. He concludes 'I think a reasonable and satisfactory way of treating the problem is to consider *S. uliginosa* Foxw. as a variety of *S. rugosa* Heim'.

Symington noted that the two varieties might occur in different habitats; they do, Foxworthy's species being confined to peat swamps and Heim's to leached sandy soils. Though the flowers, inflorescences, tomentum and bark appear similar in the two taxa there are other differences besides those mentioned by Symington. The lamina of *uliginosa* is chartaceous and prominently concave, whereas that of *rugosa* is applanate and thickly coriaceous. The habit of *uliginosa* with its oblong diffuse crown with large flopping semi-pendant leaves is quite different from the dense hemispherical crown of *rugosa.* I consequently consider that these two taxa are specifically distinct, and reinstate *S. uliginosa* Foxw.

Shorea carapae Ashton sp. nov. Plate 39.

S. coriaceae Burck affinis sed lamina 13–18 × 7–10 cm. costis lateralibus utrinsecus 11–13 subtus crassis prominentibus petiolo breviter conferte plane persistente alutaceo-sericeo differt.

Ramuli gemmae stipuli petiolique persistente conferte plane alutaceo-sericei, costis subtus costa media supra sparsim eisdem. Ramuli apices versus c. 3 × 2 mm. primo compressi rugosi dein

terescentes levescentes pallide griseo-fusci; internodis –6 cm. longis; cicatricibus stipularibus prominentibus prope amplexicaulibus descensis. Gemmae c. 7 × 2 mm. lanceolatae caudacae. Lamina 13–18 × 7–10 cm. late ovato-elliptica coriacea basi obtusa vel cordata apice in acumen breve latum attenuata; costis lateralibus utrinsecus 11–13 crassis prominentibus angulo 50°–70° exorientibus; internodis gracilibus conferte scalariformibus haud elevatis; costa media supra applanata vel paullum depressa subtus prominenti. Petiolus 23–35 mm. longus c. 2 mm. diam. teres.

Collections.—Sarawak: SK. 168 (Brunig) Batu Skalap, Merurong Plateau; S. 3864 (Pickles) S. Julan, Usun Apau; S. 13991 (Ashton) Ulu Teniai, Hose mountains. Sabah: SAN. 39323 (Meijer) Tavai plateau, Ulu Karamuak. Indonesian Kalimantan: Kostermans 13095, Mr. Palimasan, near Tabang, Ulu Belajan, W. Kutei (Holotypus in herb. Kew).

Differing from *S. coriacea* Burck, to which it appears to be most closely allied, in its larger leaf with pubescent petiole and stouter more prominent nerves. This species is characteristic of 'carapa' — pole forest under poor drainage conditions — on high level plateaux, usually between 700–1,300 m. alt., and has been observed on sandstone, dacite and also ultrabasic rocks; SAN. 39323, which is the record from the latter, is however atypical in having an unusually short petiole.

The bark morphology suggests that this species belongs to sec. *Brachyterae* Heim.

Shorea foraminifera Ashton sp. nov. Plate 40.

S. teysmannianae Dyer ex Brandis affinis sed lamina late ovata, costis lateralibus utrinsecus 8–9 subtus prominentibus domatiis magnis axillaribus costa media subtus tereti differt.

Novelli lamina stipulaque excepta fugace puberulentes. Ramuli apices versus 1–2 mm. diam. primo paullum compressi dein teretes fusci leves; internodis –3.5 cm. longis; cicatricibus stipularibus brevibus subhorizontalibus. Gemma –8 × 5 mm. ovoidea compressa subacuta. Stipula –10 × 5 mm. oblongo-elliptica obtusa caduca. Lamina 6–9 × 4–7 cm. late ovata coriacea, basi cordata vel obtusa, apice in acumen –5 mm. longum paullum falcatum abrupte attenuata; costis lateralibus utrinsecus 8–9 crassis subtus prominentibus curvatis domatiis axillaribus prominentibus foraminiferis angulo 55°–70° exorientibus basi excepta; intercostis obscuris conferte scalariformibus; costa media supra applanata subtus crassa tereti prominenti. Petiolus 10–15 mm. longus c. 2 mm. diam. Flores racemique ignoti. Pedicellus in fructu c. 1 mm. longus c. 1 mm. diam. brevis. Calyx in fructu basim versus alutaceo-puberulens apicem versus sparsim idem; lobis longioribus 3, –7 × 1.2 cm. spatulatis subacutis basim versus –4 mm. latis attenuatis partibus basalibus –11 × 5 mm. ovatis incrassatis saccatis; lobis brevioribus 2, –4.5 × 0.4 cm. loratis acutis basim versus ut in lobis longioribus. Nux –15 × 10 mm. ovoidea persistente alutaceo-pubescens breviter apiculata.

Collections.—Kep. 35719, Andulau F.R.; S. 1916 (Smythies) (Holotypus in herb. Kew), SAN. 17531 (Wood, Smythies, and Ashton) Brun. 5541 (Ashton), Andulau F.R.; Brun. 243 (Ashton) Ulu Belait Boundary rentis; s.n., Hasan, enumeration survey, Baram-Rawa, Ulu Belait, 9/2/53.

This species I had previously regarded as a variety of *S. teysmanniana* Dyer ex Brandis (Manual of the Dipterocarp Trees of Brunei State (1964) 225, where the two trees are compared). It is so far only known from Brunei, where it is sometimes very common, and is found in fresh water swamp forest unlike *S. teysmanniana* which is confined to peat.

Shorea pallidifolia Ashton sp. nov. **Plate 41.**

Species lamina ut in *S. elliptica* Burck sed 13–22 × 7–13 cm. maiori tomento ochraceo scabrido basi subcordata costis lateralibus utrinsecus 12–19.

Ramuli gemmae stipulae costae laminarum subtus petiolique persistente pallide flavo-brunneo-scabrido-tomentosi, lamina subtus brevissime conferte persistente ochraceo-scabrido-pubescens. Ramuli apices versus c. 6 × 3 mm. diam. crassi primo compressi costati dein terescentes; internodis 1–4 cm. longis; cicatricibus stipularibus –2 mm. longis subhorizontalibus prominentibus. Gemma –10 × 8 mm. late ovoideo-conica compressa. Stipula –15 × 7 mm. oblonga obtusa caduca. Lamina 13–22 × 7–13 cm. late oblonga vel ovata vel obovata coriacea, basi obtusa vel subcordata, apice in acumen breve latum abrupte attenuata; costis lateralibus utrinsecus 12–19 curvatis supra obscuris subtus prominentibus basim versus angulo –110° exorientibus apicem versus angulo 45°–70° exorientibus; intercosti gracilibus conferte scalariformibus subtus vix elevatis; costa media supra obscura depressa subtus prominenti. Petiolus 2–3.5 cm. longus c. 4 mm. diam. crassus sicco rugosus. Racemi –15 cm. longi, stipitis basi in fructu –4 mm. diam., paullum compressi angulati axillares velrare terminales semel vel bis ramosi; ramulis –3 cm. longis –6 flores distichos gerentibus; bracteolis –4 × 3 mm. ellipticis obtusis caducis externe breviter plane pubescentibus intus glabris. Alabastrum –6 × 3 mm. ellipsoideum. Lobi calycis partibus in alabastro expositis pubescentibus, extoriores 3 deltoidei acuti internis 2 ovati quam externi 3 minores marginem versus tenuores. Petala elliptica partibus in alabastro expositis pubescentibus. Stamina ignota. Ovarium ovoideum glabrum, stylo filiformi glabro quam ovarium paullum longiore. Pedicellus calyxque in fructu breviter sparsim plane pubescens. Pedicellus c. 1 mm. longus c. 1 mm. diam. parvus. Lobi calycis longiores 3, –7 × 1.5 cm. late spatulati obtusi basim versus –7 mm. lati attenuati, partibus basalibus –10 × 8 mm. late ovatis paullum incrassatis; lobi breviores 2, –4 × 0.3 mm. lineares basim versus ut in lobi longiores. Nux –12 × 9 mm. ovoidea breviter apiculata conferte breviter pallide alutaceo-pubescens.

Collections.—Sarawak: S. 16054 (Rashid) Bako National Park (Holotypus in Herb. Kew); Kep. 79314 (Wyatt-Smith) Munggu Unjam F.R.; S. 7452 (Brunig) Selang F.R.; S. 9315 (Bujang)

Setapok F.R.; S. 5957, 6161 (Brunig) Sempadi F.R.; S 13357 (Abang Muas) Balai Ringin P.F.

As the stamens are unknown this species cannot be placed in a section with conviction, though it appears to be most closely allied to *S. elliptica* Burck in Section Rubella Ashton; it differs in the larger lamina with more abundant nerves and ocherous scabrid not cream tomentose undersurface like *S. elliptica*. It is confined to the region of West Sarawak, where it is found in Heath forest.

Shorea praestans Ashton sp. nov. **Plate 42.**

S. stenoptera Burck, *S. macrophylla* (De Vr.) Ashton affinis sed lamina 24–35 × 11–20 cm. maiore basi cordata stipulis 4–6.5 cm. longis glabris maioribus differt.

Partes ex integro glabri. Ramuli apices versus c. 5 × 3 mm. crassi compressi leves; internodis 3–4.5 cm. longis; cicatricibus stipularibus gracilibus evidentibus amplexicaulibus. Gemma –25 × 7 mm. falcato lanceolata compressa acuta. Stipulae –11 × 5 cm. grandissimae ellipticae subacutae subpersistentes. Lamina 24–35 × 11–18 cm. grandis plus minus late oblonga coriacea basi cordata apice obtusa vel breviter late acuminata; costis lateralibus utrinsecus 11–13 supra obscuris subtus prominentibus angulo 45°–70° exorientibus basi excepta; intercostis remote scalariformibus gracilibus subtus evidentibus; costa media supra applanata subtus prominenti. Petiolus 4–6.5 cm. longus c. 5 mm. diam. crassus sicco nigrescens rugescens. Flores racemique ignoti. Fructus ex integro glaber. Pedicellus in fructu c. 5 mm. longus c. 5 mm. diam. crassus. Calyx lobis longioribus 3, –15 × 3 cm. spatulatis obtusis basim versus c. 1.5 cm. latis attenuatis partibus basalibus –1.5 × 1.8 cm. late ellipticis saccatis; lobis brevioribus 2, –10 × 1.5 cm. loratis subacutis basim versus ut in lobis longioribus. Nux –2 × 2 cm. ovoidea glabra stylopodio –4 mm. longo filiformi attenuata.

Collections.—Sarawak: s.n., 18.6.58 (Anderson), s.n. (Brunig) (Holotypus in herb. Kew), S. 22074, 22075 (Ashton) Bintulu reservoir, Nyabau F.R.; S. 19598 (Ashton) Ulu Kenyana, Mukah.

This is a local species, known so far in Central Sarawak; though this small tree of Heath forest is closely allied to *S. stenoptera* Burck the lamina is considerably larger, the base cordate and the petiole relatively longer. Though only immature fruit have been collected they appear to be more similar to those of *S. beccariana* Burck than *S. stenoptera*, with relatively small nut and 3 long aliform calyx lobes.

Shorea pubistyla Ashton sp. nov. **Plate 43.**

S. scaberrimae Burck *S. fallaci* Meijer affinis sed lamina latiore basi cordata petiolo racemoque longiore lobis calycis in fructu longioribus aliformibus differt.

Ramuli gemmae costa media subtus petiolique conferte persistente scabrido-fulvo-tomentosi; costae laminae costa media supra stipulae externe breviore scabrido-tomentosi stipulae intus caduce plane pubescentes. Ramuli apices versus c. 7 mm. diam. crassi primo prominente costati dein terescentes; internodis 1–3 cm. longis; cicatricibus stipularibus c. 2 mm. longus horizontalibus obscuris. Gemmae –1.3 mm. longae –1.3 mm. diam. ovoideo-compressae. Stipulae –2.5 × 0.7 cm. lanceolatae subcaudatae caducae. Lamina 11–19 × 7–12 cm. late oblonga vel obovata coriacea, basi obtusa vel cordata, apice subretusa vel breviter acuminata; costis lateralibus utrinsecus 14–16 supra obscure depressis subtus prominentibus basim versus angulo –110° exorientibus apicem versus angulo –45° exorientibus; intercostis remote scalariformibus subtus prominentibus. Petiolus 2.5–4 cm. longus c. 3 mm. diam. crassus. Racemi –20 cm. longi, stipitis basi in fructu –3 mm. diam., costati conferte breviter fulvo-scabrido-tomentosi laxi axillares semel ramosi; ramulis –6 cm. longis –12 flores secundis gerentibus; bracteolis –8 × 5 mm. oblongo-ovatis subacutis breviter plane pubescentibus caducis. Alabastrum –7 × 3 mm. lonceolatum. Lobi calycis conferte tomentosi exterioribus 3 ovatis acutis interioribus 2 ovatis marginem versus fimbriatis quam exterioribus tenuioribus basim versus angustioribus. Petala externe rosea intus coccinea elliptico-lanceolata partibus in alabastro expositis pubescentibus. Stamina 15 internis 5 quam externis 10 paullum longioribus; filamentis basim versus latis compressis apicem versus filiformibus abrupte attenuatis; antheris late ellipsoideis; aristis gracilibus glabris quam antheris 2–3-plo longioribus. Ovarium ovoideum conferte pubescente stylopodio quam ovarium paullum longiore crasso columellari conferte pubescenti stylo brevi glabro. Pedicellus in fructu –3 mm. longus, –3 mm. diam. crassus. Calyx in fructu basim versus sparsim caduce pubescens; lobis longioribus 3, –14 × 2.5 cm. spatulatis obtusis basim versus –8 mm. latis attenuatis; partibus basalibus –1.3 × 1.4 cm. late ovatis saccatis incrassatis; lobis brevioribus 2, –12 × 1.2 cm. loratis obtusis aliter ut in lobis longiorbus. Nux –3 × 1.8 cm. anguste ovoideis conferte breviter plane pallide cremio-pubescens apice in apiculo –4 cm. longo attenuata.

Collections.—S. 14930 (Anderson) (Holotypus in herb. Kew) S. 15000, 14938 (Rosli), S. 15182 Galau), tree no. 614, 51 (Asah), FA. 1301 (Carroll) Semengoh F.R.; S. 6227 (Brunig) Sempadi F.R.; Sinclair and Kadim 10258, Gunong Gaharu, Serian; S. 16473 (Ashton) Ulu Kelawit, Tatau; S. 19575 (Ashton) Bt. Iju, Arip, Balingian; Hotta 15720, 219, Minah camp, Kakus; S. 2118 (Smythies) Bt. Teraja.

This species is identical in floral characters to *S. scaberrima* Burck, but differs in the longer inflorescence and fruit sepals, smaller nut, and larger coriaceous leaves with cordate bases and longer petioles.

It is found in Mixed Dipterocarp forest on leached clay rich soils, both overlying shales and rhyolite, in many localities west of the Belait drainage in Brunei and throughout Sarawak.

Shorea rotundifolia Ashton sp. nov. **Plate 44.**

S. amplexicaulis Ashton affinis sed laminis alternatis remotis orbicularibus; stipulis –6×2 cm. grandibus subpersistentibus; petiolis 3–4 cm. longis.

Ramuli apices versus petioli stipulaeque pruinosi aliter glabri. Ramuli apices versus c. 3×2 mm. diam. teretes vel paullum compressi atro-brunnei leves dein pallide brunnescentes; internodis –6 cm. longis; cicatricibus stipularibus amplexicaulibus prominentibus. Gemma –20×8 mm. grandis lanceolata compressa. Stipula –6×2 cm. lanceolato-falcata obtusa subpersistens. Lamina 9–21×8–14 cm. alternata late ovata vel suborbicularis coriacea plus minus lustra basi obtusa vel cordata apice in acumen –1 cm. longum cuspidatum attenuata; costis lateralibus utrinescus 9–11 curvatis subtus prominentibus basim versus angulo –115° apicem versus angulo c. 45° exorientibus; intercostis remote scalariformibus; costa media supra applanata subtus prominenti tereti. Petiolus 3–4 cm. longus, c. 3 mm. diam. longissimus sicco nigrescens. Flores inflorescentiaeque ignoti. Fructus ex integro glaber. Pedicellus in fructu c. 6 mm. longus c. 3 mm. diam. Lobi longiores calycis in fructu 3, c. 13×2.5 cm. spatulati obtusi basim versus c. 6 mm. lati attenuati partibus basalibus c. 15×18 mm. saccatis; lobis breviores 2, –8×0.7 cm. anguste lanceolati subacuti basim versus ut in lobis longioribus. Nux c. 2.5×1.8 cm. ovoidea glabra in stylopodio –7 mm. longo attenuata.

Collections.—S. 9470 (Smythies) S. Iran, Pelagus (Holotypus in herb. Kew); S. 22051, 22053 (Ashton) Ulu Segan, Bintulu.

This local species of Central Sarawak is locally frequent on sandstone knolls and ridges below 500 m. alt. There it is frequently found actually in association with its close ally *S. amplexicaulis*, but I have found no evidence of hybridisation in the forest.

Shorea sagittata Ashton sp. nov. **Plate 45.**

S. ferrugineae Dyer ex Brandis affinis sed lamina subtus ramulisque conferte breviter persistente roseo-fusco-scabrido-tomentosis costis lateralibus utrinsecus 19–25 differt.

Lamina supra plane caduce cremio-pubescens, folia aliter ramulique conferte breviter persistente roseo-fusco-scabrido-tomentosi. Ramuli apices versus c. 2 mm. diam. teretes costati dein rufescentes verruculescentes; internodis –3 cm. longis; cicatricibus stipularibus brevibus ascensis. Gemmae –7×7 mm. late ovoideae. Stipulae –10×8 mm. ovatae subacutae saccatae caducae. Lamina 7–14.5×3–6 cm. anguste oblonga vel lanceolata, basi obtusa, apice in acumen –1.5 cm. longum gracile attenuata; costis lateralibus utrinsecus 19–25 gracilibus subtus prominentibus basim versus angulo 70°–80° apicem versus angulo –50° exorientibus; intercostis gracilibus conferte scalariformibus; costa media supra depressa subtus prominenti. Petiolus 9–17 mm. longus 2–3 mm. diam. persistente roseo-fusco-scabrido-tomentosus. Flores ignoti. Racemi –6 cm. longi, stipitis basi in fructu c. 2 mm. diam., conferte persistente roseo-fusco-scabrido-tomentosi semel ramosi. Calyx in

fructu sparsim puberulens; lobis longioribus 3, –11 × 2.5 cm. lorato-spatulatis obtusis basim versus –8 mm. latis vix attenuatis prominente sagittato-auriculatis in media parte saccatis incrassatis, lobis longioribus 2, –20 × 3 mm. linearibus acutis basim versus haud auriculatis. Nux –15 × 8 mm. ellipsoidea breviter apiculata apicem versus puberulens.

Collection.—S. 15882 (Ilias) Nyabau F.R.; FA. 566 (Wright) Ulu Gedong, Sadong; S. 18316 (Ashton) Ulu Sinrok, Similajau F.R.; FA. 420 (Wright) Baleh; S. 7608, 7609 (Brunig) Bungoh range; Hotta 15714, Minah camp, Kakus; S. 23616 (Sibat) (Holotypus in herb. Kew), S. 23720 (Jugah) Bt. Iju, Arip; S. 22727 (Murthy and Ashton) G. Dulit.

With close affinities to *S. ferruginea* Brandis, *S. sagittata* is in leaf characters almost indistinguishable from *Shorea ovalis* (Korth) Bl. ssp. *ovalis* of southern Kalimantan, Sumatra and Malaya, though the auriculate fruit calyx is entirely different from that species. The similarity to *S. ferruginea* extends to the bark morphology, which is overall smooth, later patchily shallowly cracking and flaking to leave a secondary smooth surface.

Recently flowering material of *S. ferruginea,* SA. 622, has come to light; the flowers are typical of section *Muticae* Brandis.

With the addition of the present species, and with the systematic position of *S. ferruginea* now confirmed, it is all the more clear that *S. ferruginea* Brandis, *S. macroptera* Dyer, *S. slooteni* Wood ex Ashton, *S. myrionerva* Ashton, *S. acuta* Ashton and *S. sagittata* Ashton form a well defined natural group within section *Muticae* Brandis characteristed by their auriculate fruits and very different bark morphology from other species. Whitmore (Gard. Bull. Sing. 19 (1962) 358) has already anticipated this in his bark studies. I therefore propose to designate this unit as a new subsection.

Shorea sect. **Muticae** Brandis, subsect. **Auriculatae** Ashton subsect. nov.

Type species: *S. macroptera* Dyer.

Flores ut in Sect. *Muticae* Brandis sed lobi calycis in fructu basim versus auriculatae.

6 species: Malaya (1), Sumatra (1), Borneo (6).

On the basis of the bark morphology Whitmore places *S. macroptera* in the same group as the species of Section *Pachycarpae,* calling the group as a whole the Kawang subgroup. The bark of these species characteristically remains smooth, and of Whitmore's Bark Manifestation Smoth C, at least until maturity.

The definition of this manifestation is as follows (quoted from Whitmore):

'Periderms: 1–2 present together. Inner bark structure: expansion tissue of tangentially elongate stone cells and parenchyma; phloem proliferation tissue usually widespread, of parenchyma and large circular stone cells. Outer bark structure: thin rhytidome layers to 1–2 mm. thick. Sloughing: apparently absent. Surface: either finely sculptured rugose, rugulose, or not sculptured, smooth with small lenticels.' At maturity, unlike numbers of sect. *Pachycarpae,* members of this subsection may become shallowly fissured, exhibiting bark manifestation shallowly fissured C. This manifestation differs from that of the characteristic manifestation as follows: 'Expansion tissue in uniformly distributed fingers, — uniseriate files of tangentially elongate stone cells; fissures not penetrating into inner bark.'

Shorea sect. **Muticae** Brandis, subsect. **Muticae.**

Lobi calycis in fructu haud auriculata.

Bark surface early becoming fissured, of Bark Manifestation shallow fissured A, sometimes becoming flaky on the butt in old trees. This manifestation is defined by Whitmore as follows:—

'Periderms: multiple structure, thickness variable (0.03–0.20 mm.), phellems black and usually leathery, phelloderm either apparently absent, or 0.25 mm. thick; several, close (0.5–1.0 mm. apart, rarely more); not parallel to cambium for more than 1–3 cm. on T.S. Inner bark structure: pseudocortex present; expansion at first by fingers and wedges, then by wedges only. Outer bark structure: essentially a superficial skin, 3 mm. or less, usually dipping in at, and bounding the fissures. Sloughing: on poles usually absent; in crown absent or as layer thick, brittle, thin, scales, adherent before sloughing. Surface closely, more or less regularly, V-section fissured; fissures penetrating inner bark; ridges smooth, sometimes micro-lichen flecked; surface firm, dark coloured, at a periderm; bole smooth-fissured, becoming coarsely fissured in old trees'.

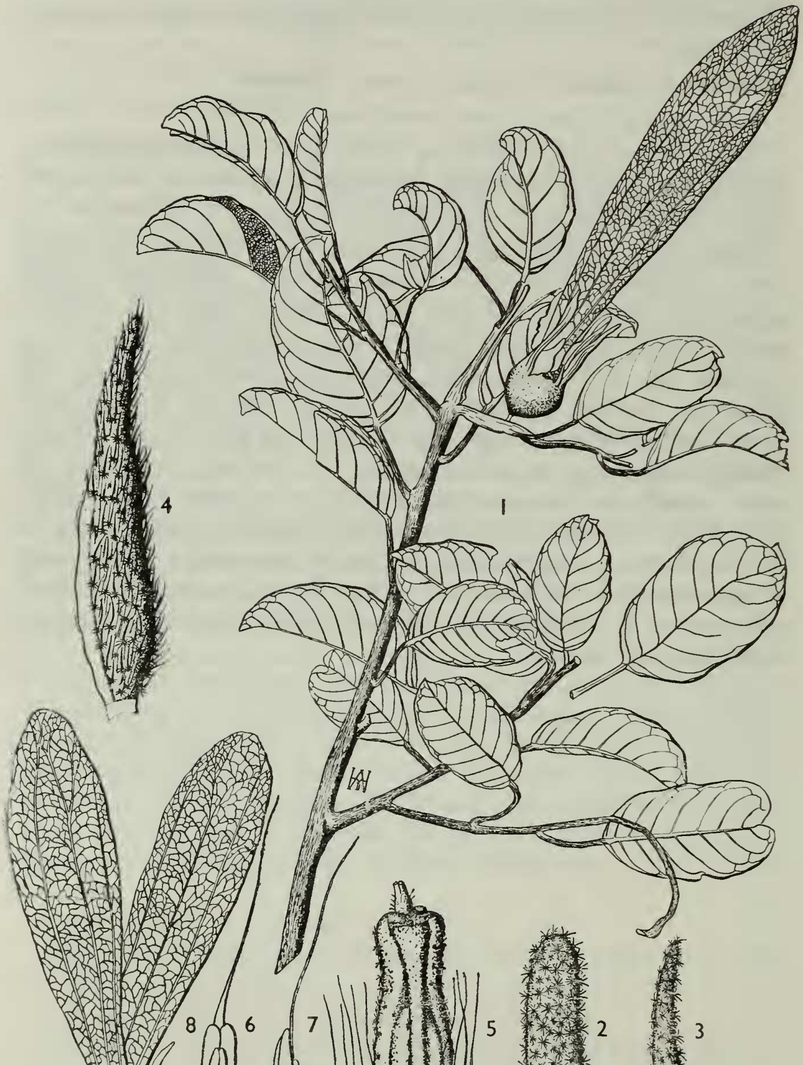


Plate 1. *Anisoptera reticulata.*

1, Fruiting branchlet; 2, minor, 3, major flower sepal; 4, petal; 5, androecium and gynoecium; 6, posterior, 7, lateral view of stamens; 8, fruit. From SAN. 12864. 1, 8 = x ½; 2–5 = x 10; 6, 7 = x 20.

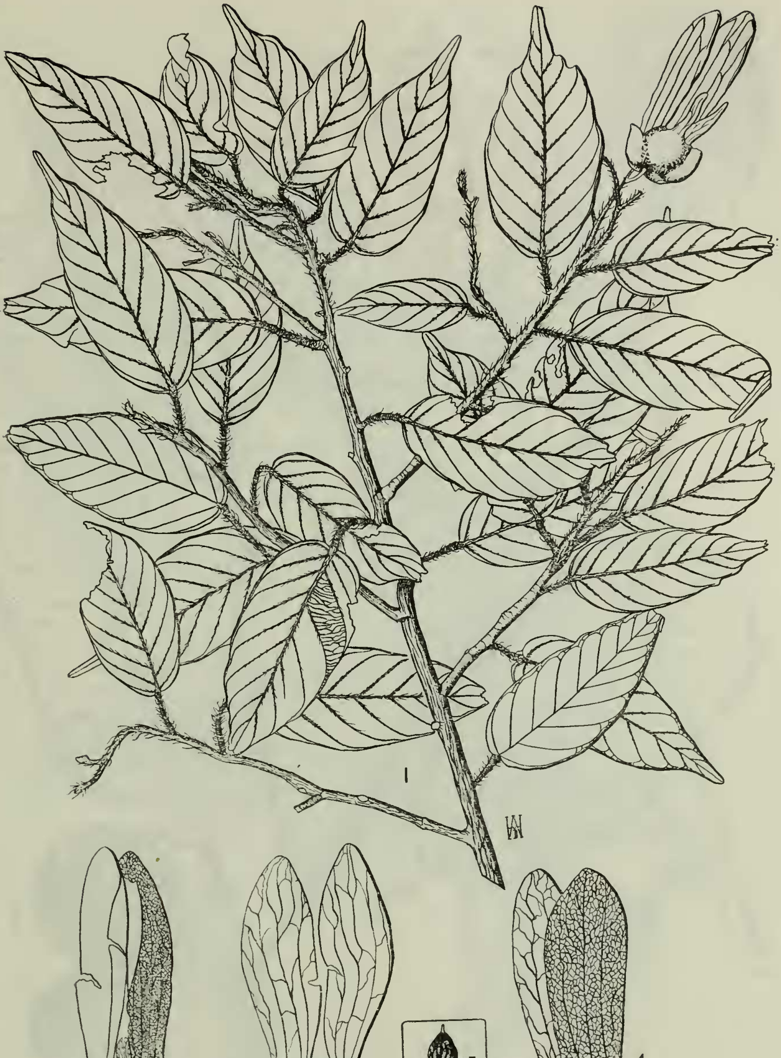


Plate 2. *Dipterocarpus cuspidatus.*

1, Fruiting branchlet; 2–4 fruit; 5, apex of nut. From S. 15821. 1–4 = x $\frac{1}{2}$; 5 =x 1.

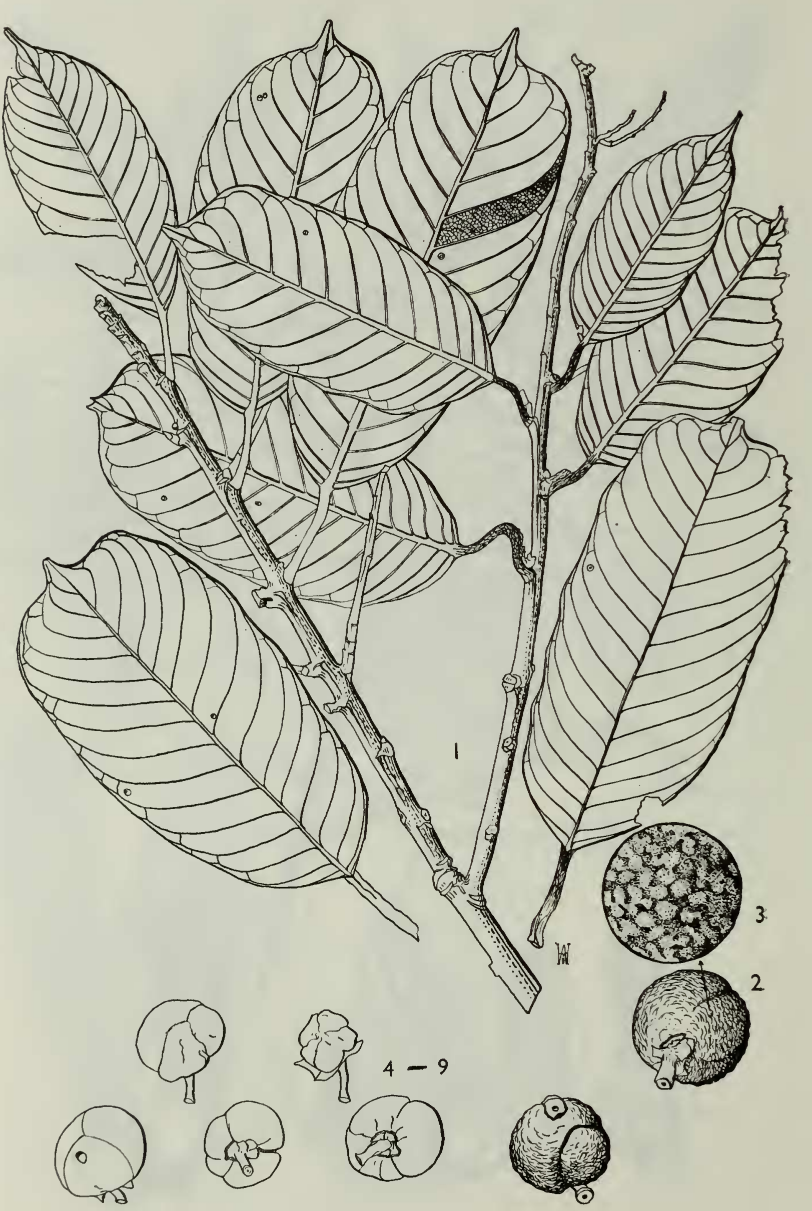


Plate 3. *Vatica oblongifolia* ssp. *oblongifolia.*

1, Leafy twig; 2, 4–9, fruit; 3, surface configuration of pericarp. From S. 12816. 1, 2, 4–9 = x ½; 3 = x 2.

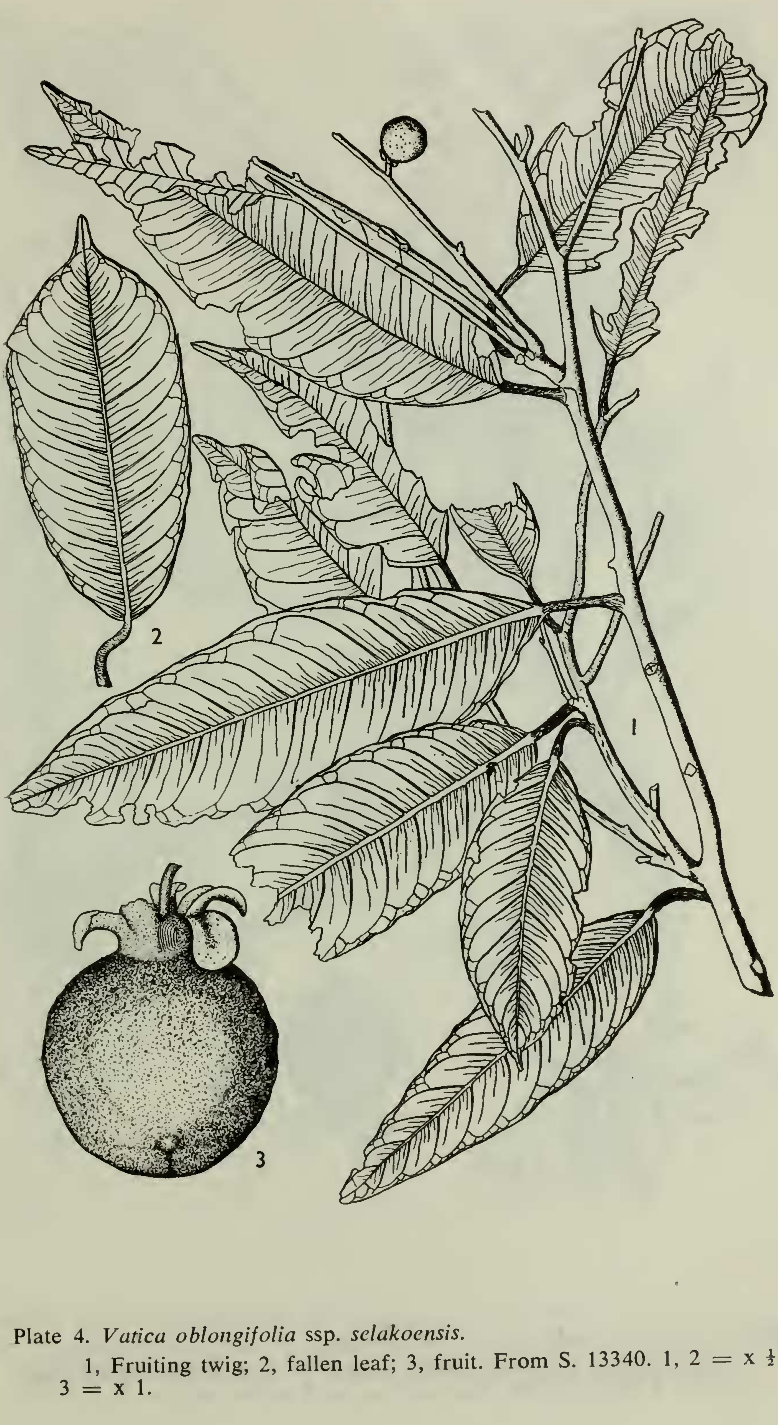


Plate 4. *Vatica oblongifolia* ssp. *selakoensis*.

1, Fruiting twig; 2, fallen leaf; 3, fruit. From S. 13340. 1, 2 = x ½; 3 = x 1.

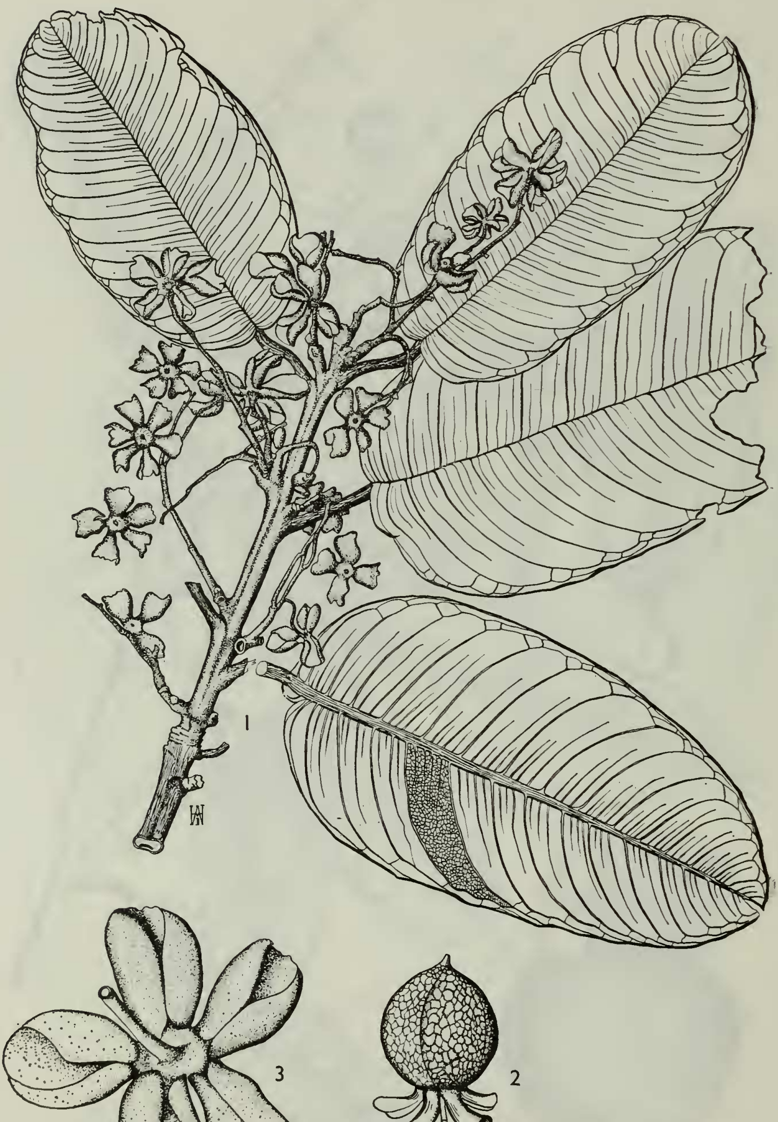


Plate 5. *Vatica oglongifolia* ssp. *crassilobata.*

1, branchlet with young fruit; 2, fruit; 3, fruit calyx. 1 from Brun. 614, 2, 3 from S. 2246. 1 = x 1/3, 2 = x ½, 3 = x 1.

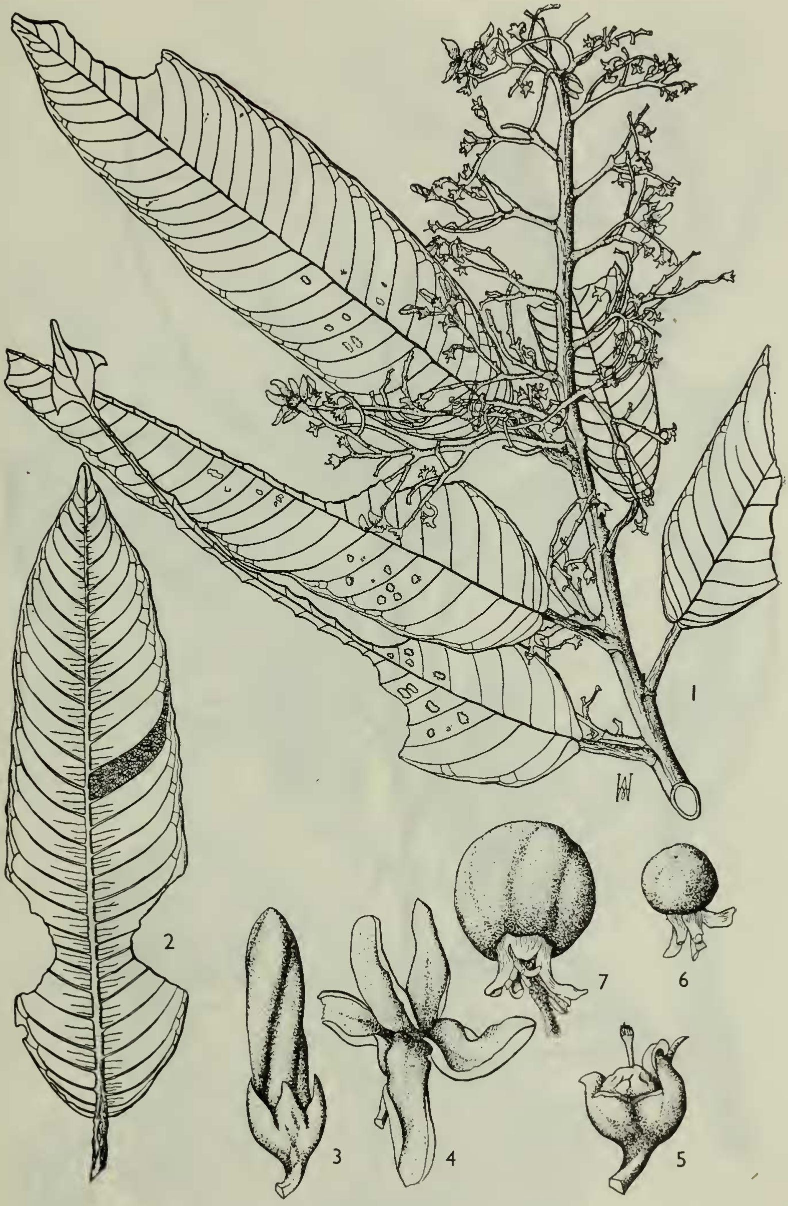


Plate 6. *Vatica oblongifolia* ssp. *multinervosa.*

1, flowering branchlet; 2, fallen leaf; 3, flower bud; 4, open flower; 5, gynoecium; 6, 7, fruit. 1–5 from SAN. 18475; 6, 7, from SAN. 26029. 1, 2 = x ½; 3, 4 = x 5; 5 = x 8; 6, 7 = x 1.

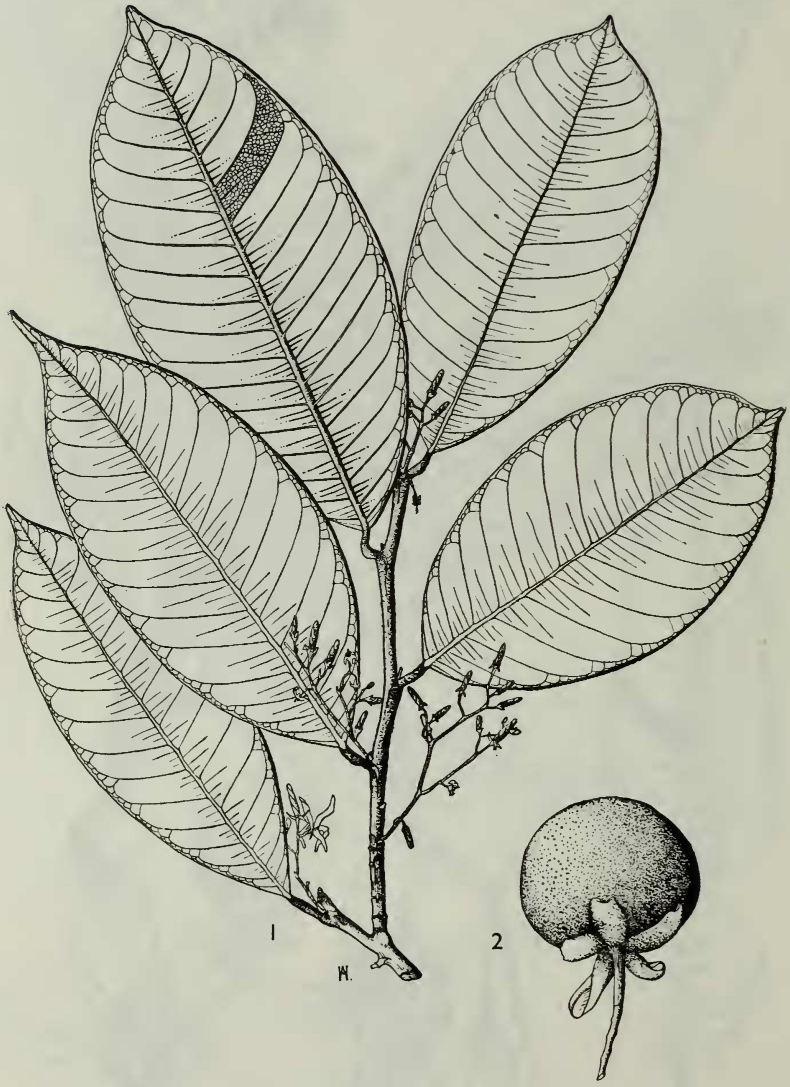


Plate 7. *Vatica oblongifolia* ssp. *elliptifolia.*

1, Flowering branchlet (x ½, from S. 23225); 2, fruit (x 2, from Brun 925).

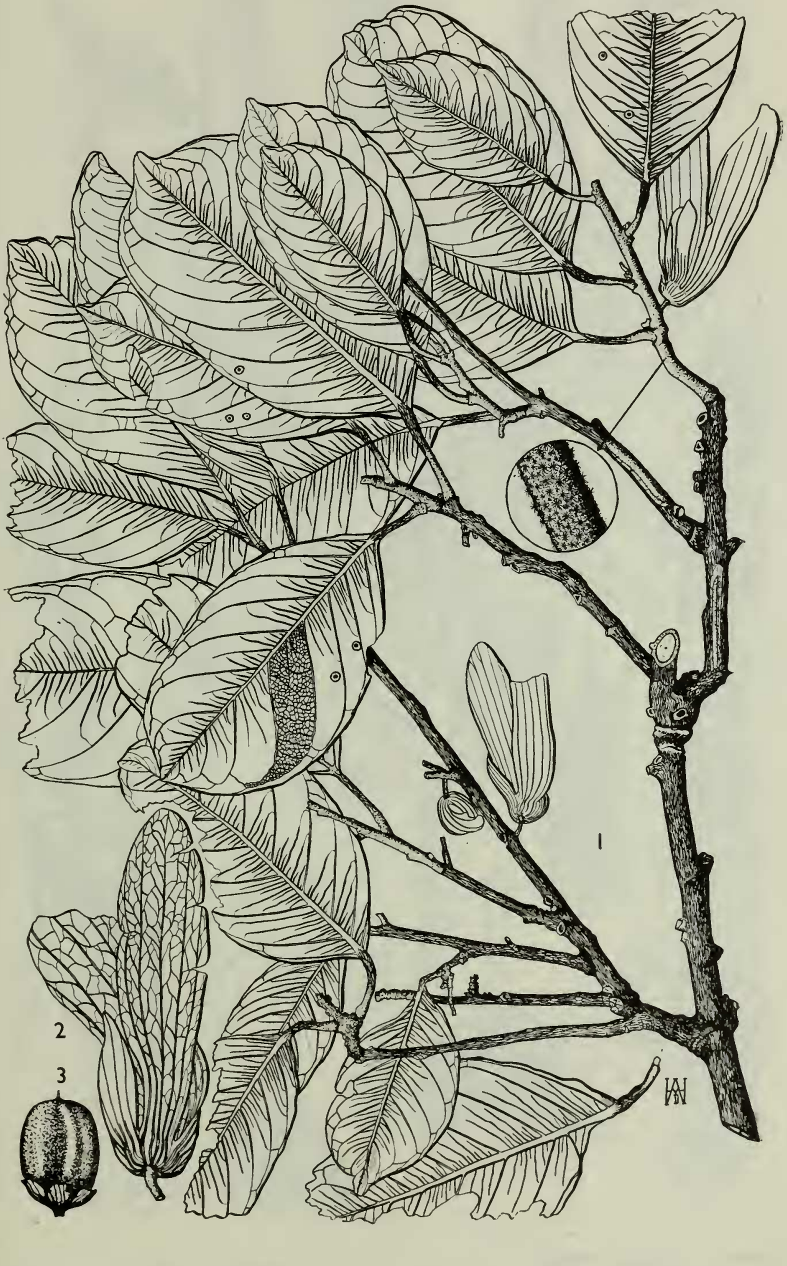


Plate 8. *Vatica badiifolia.*

1, Fruiting branchlet; 2, fruit; 3, ripe nut. From S. 15857. 1 = x ½, 2 = x 2/3, 3 = x 2.

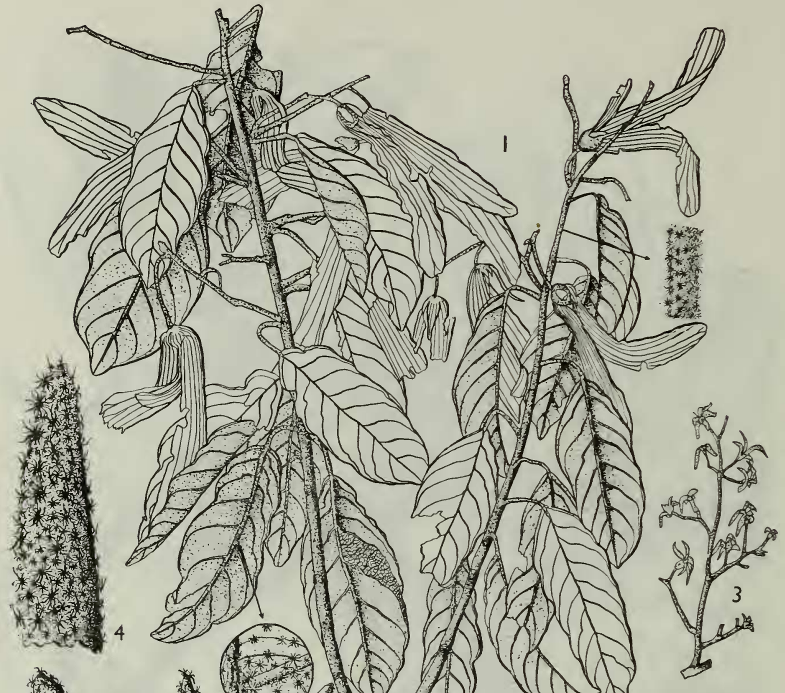


Plate 9. *Vatica brunigi*.

1, fruiting branchlet; 2, fallen leaf; 3, flowering inflorescence; 4, 6, major, 5, minor floral sepals; 7, petal; 8, androecium and gynoecium; 9, lateral view of stamens; 10, gynoecium; 11, ripe nut. 1, 11 from S. 17045; 2–10 from S. 17885. 1, 3 = x 1/3; 2 = x ½; 4–8, 10 = x 10; 9 = x 20; 11 = x 2.

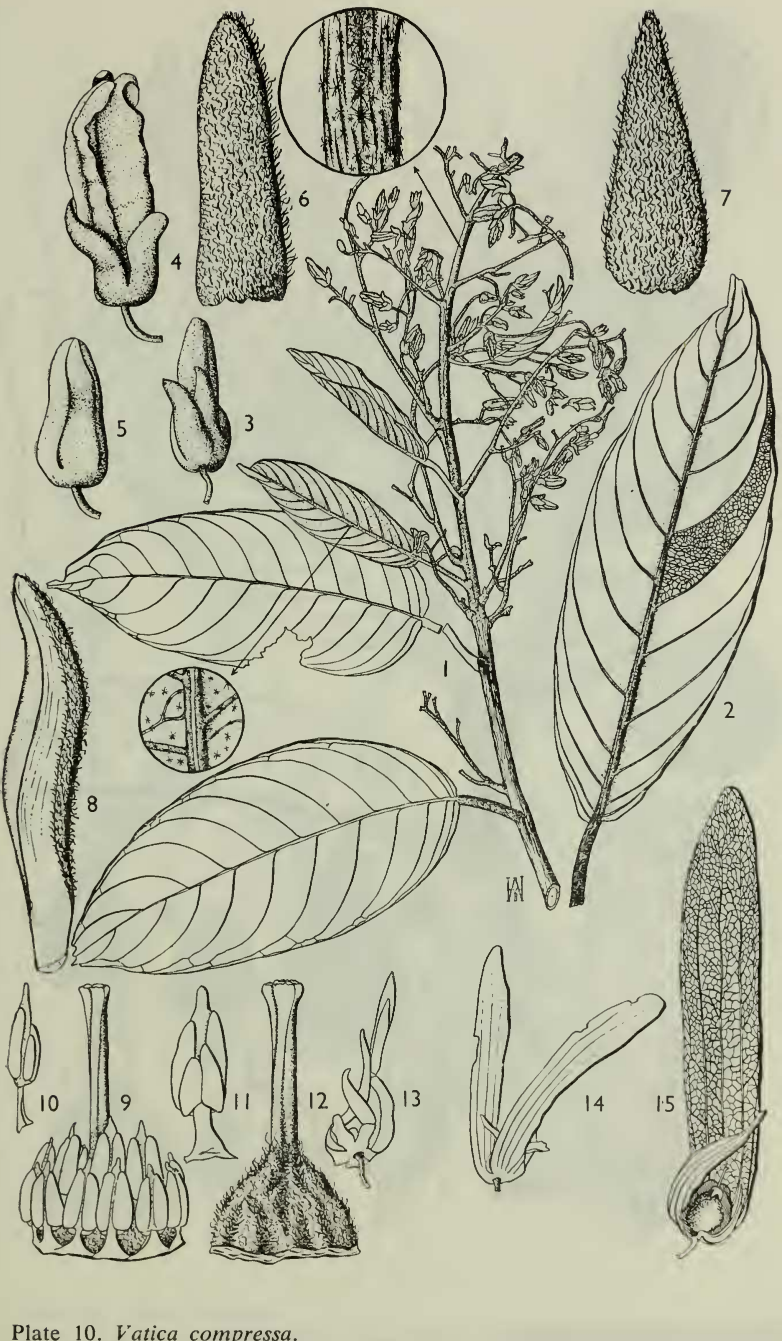


Plate 10. *Vatica compressa.*

1, flowering branchlet; 2, fallen leaf; 3–5, flower buds; 6, major, 7, minor floral sepals; 8, petal; 9, androecium and gynoecium; 10, lateral, 11, posterior view of stamen; 12 gynoecium; 13, 14, young; 15, mature fruit. 1–12 from SA. 604; 13–15, from SFN. 35618. 1, 2 — x ½; 3–5 — x 3; 6–9, 12 = x 10; 10, 11 = x 15; 13–15 = x 1.

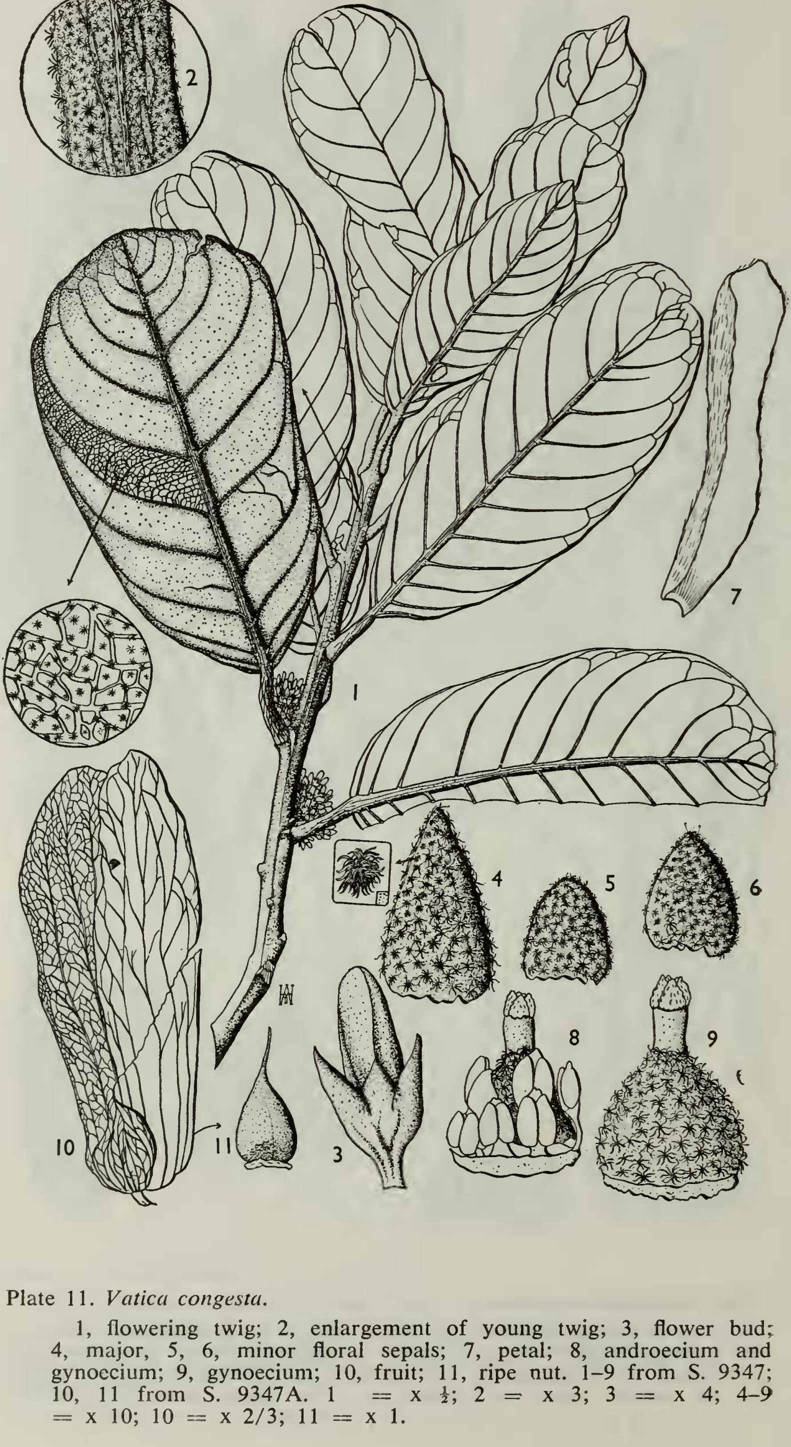


Plate 11. *Vatica congesta.*

1, flowering twig; 2, enlargement of young twig; 3, flower bud; 4, major, 5, 6, minor floral sepals; 7, petal; 8, androecium and gynoecium; 9, gynoecium; 10, fruit; 11, ripe nut. 1–9 from S. 9347; 10, 11 from S. 9347A. 1 = x ½; 2 = x 3; 3 = x 4; 4–9 = x 10; 10 = x 2/3; 11 = x 1.

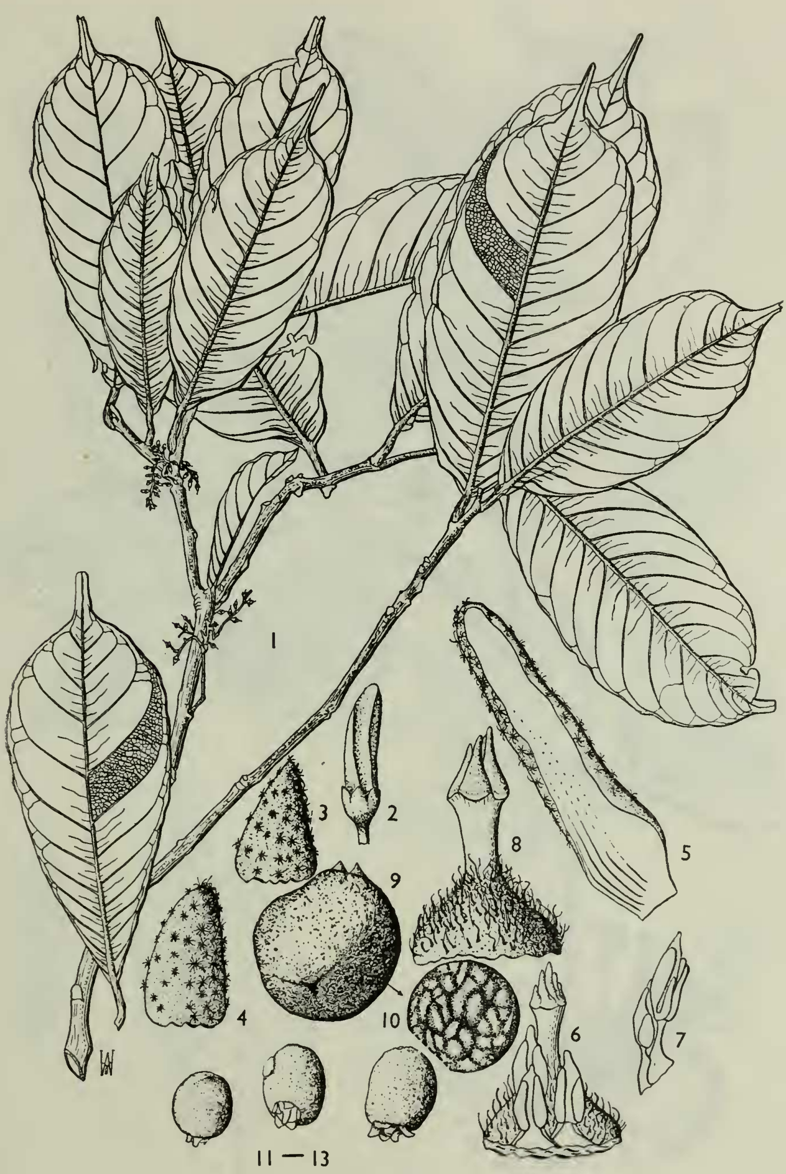


Plate 12. *Vatica globosa.*

1, flowering branchlet; 2, flower bud; 3, minorg; 4, major floral sepal; 5, petal; 6, androecium and gynoécium; 7, lateral view of stamens; 8, gynoecium; 9, 11–13, fruits; 10, surface configuration of pericarp. 1–8 from Haviland and Hose 3159; 9–13 from S 18091. 1 = x ½; 2 = x 4; 3–8 = x 15; 9–13 = x 1.

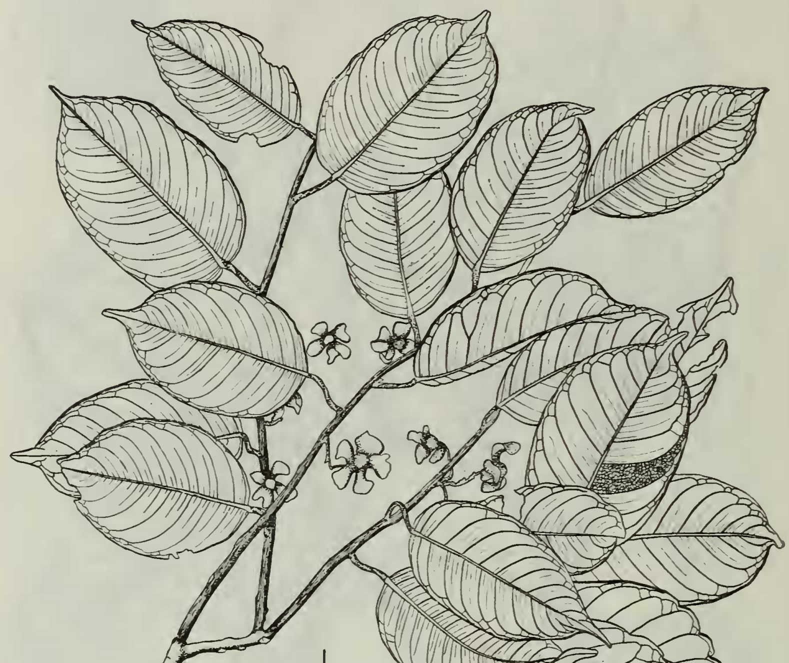


Plate 13. *Vatica rotata.*

1, fruiting branchlet; 2, fallen leaf; 3, fruit. 1, 2 = x ½; 3 = x 3.

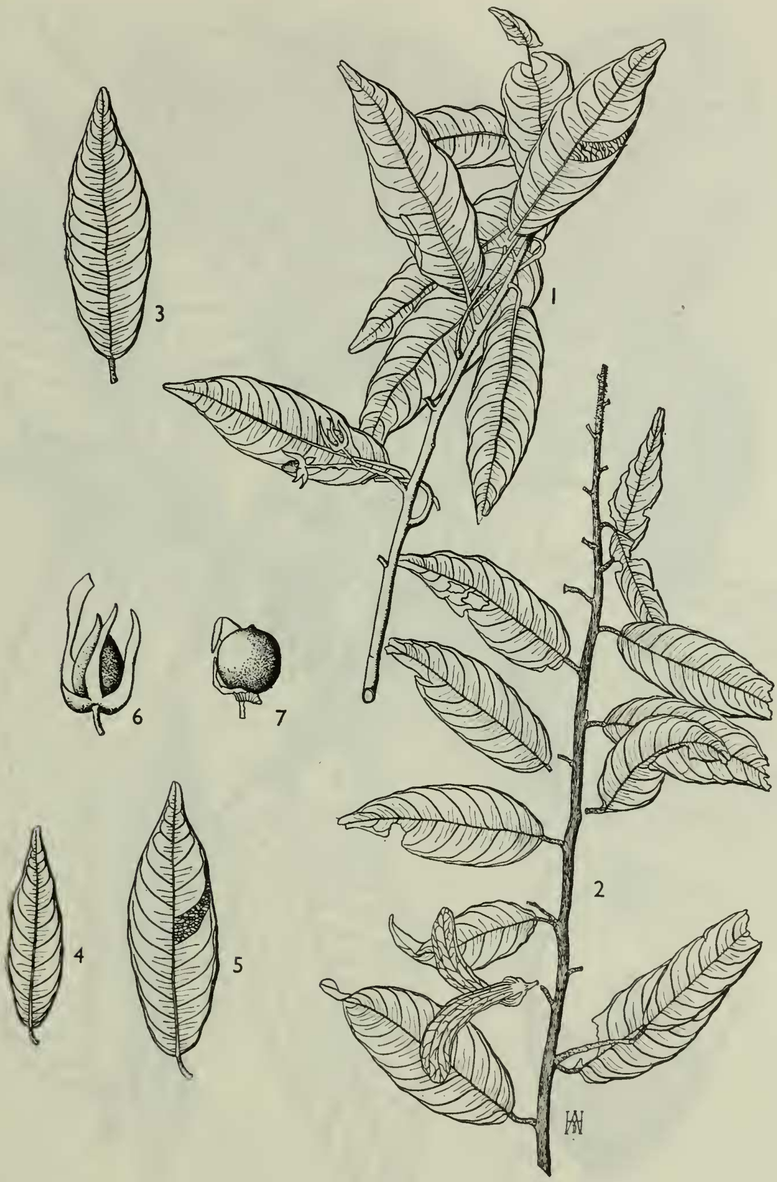


Plate 14. *Vatica rynchocarpa.*

1, branchlet with young, and 2, mature, fruit; 3–5, fallen leaf; 6, 7, ripe nut. From Brun. 3354. 1–5 = x ½; 6, 7, = x 1.

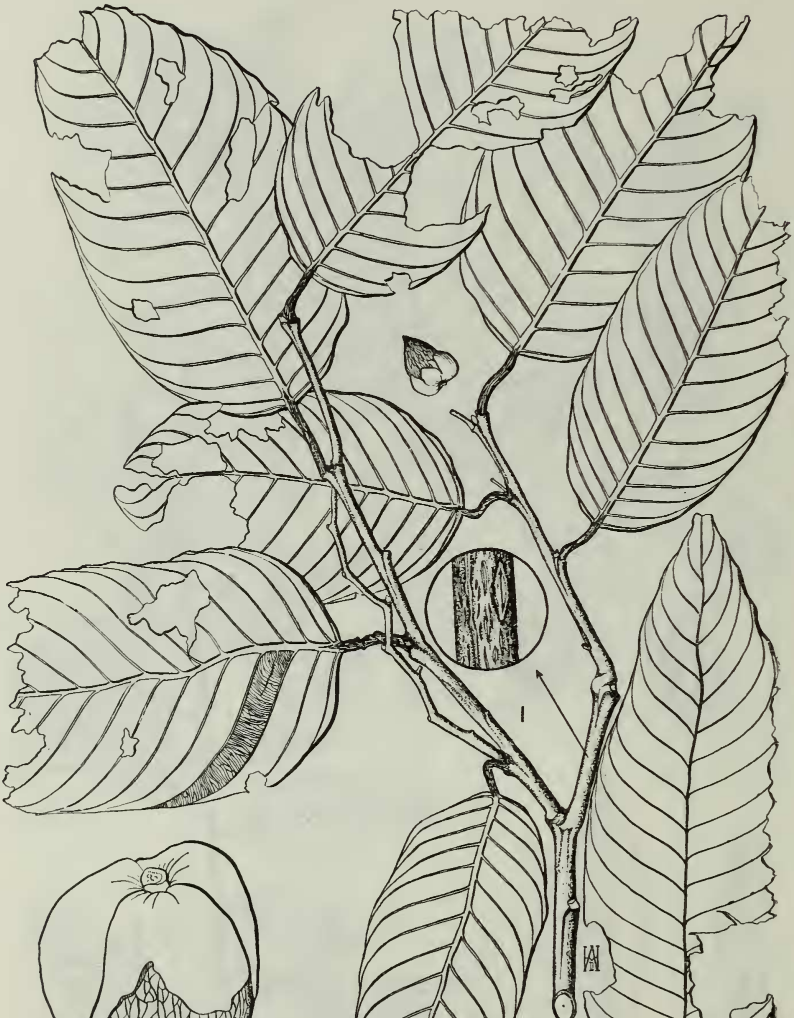


Plate 15. *Hopea aequalis.*

1, fruiting branchlet (x ½); 2, fruit (x 2). From S. 15881.

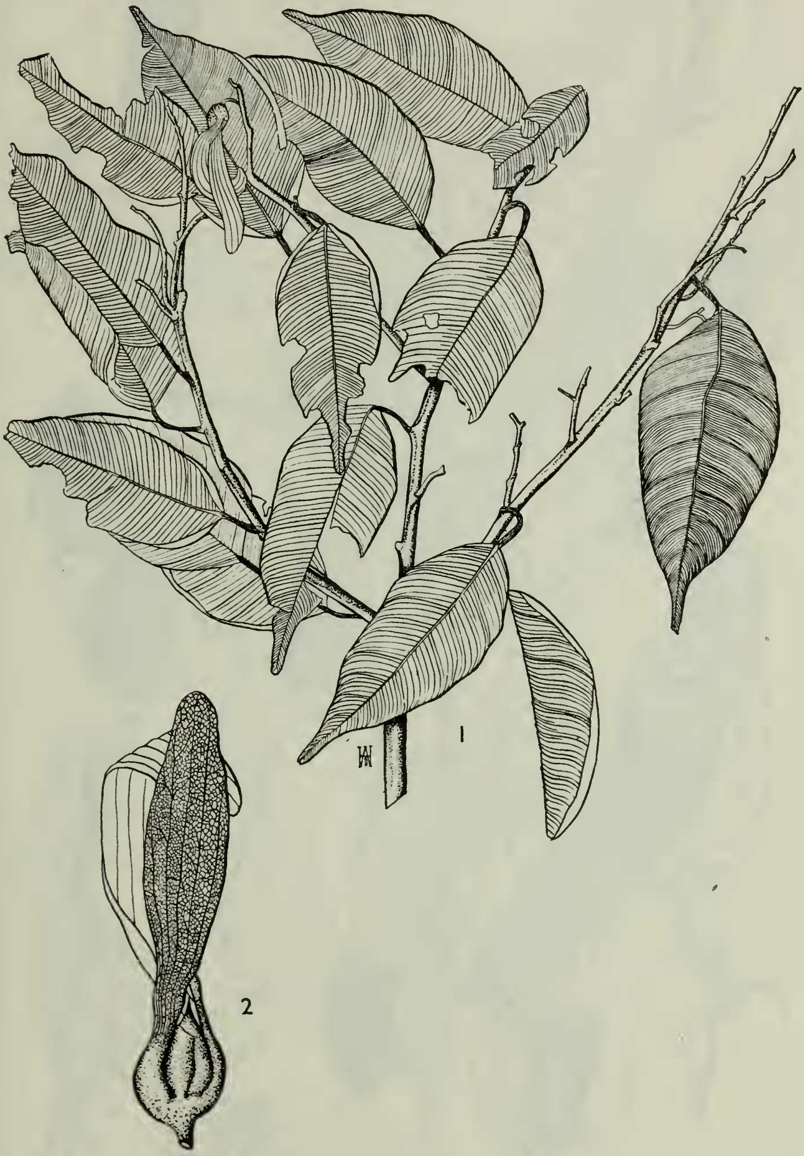


Plate 16. *Hopea altocollina.*
1, fruiting branchlet (x ½); 2, fruit (x 2). From Brun. 1030.

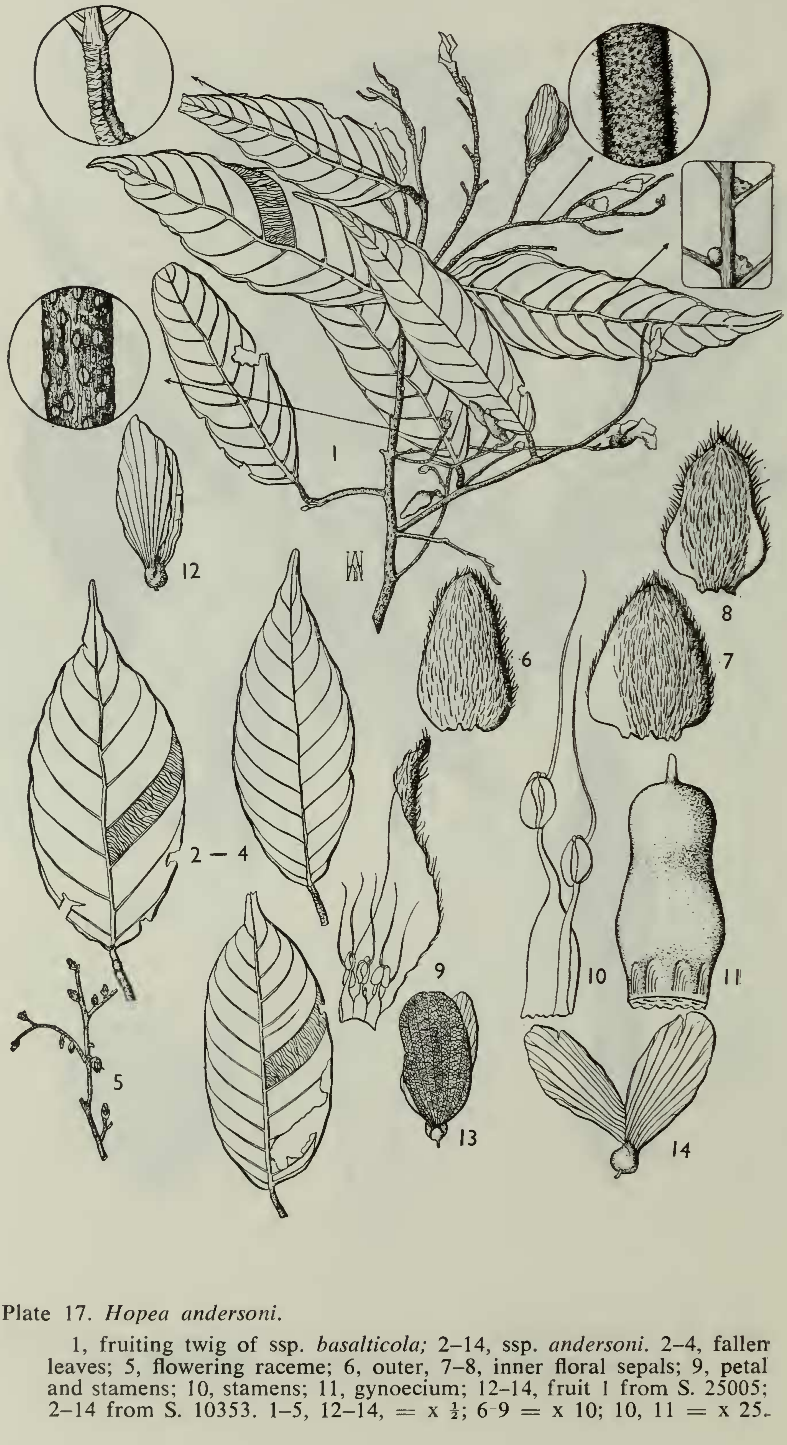


Plate 17. *Hopea andersoni.*

1, fruiting twig of ssp. *basalticola;* 2–14, ssp. *andersoni.* 2–4, fallen leaves; 5, flowering raceme; 6, outer, 7–8, inner floral sepals; 9, petal and stamens; 10, stamens; 11, gynoecium; 12–14, fruit 1 from S. 25005; 2–14 from S. 10353. 1–5, 12–14, = x ½; 6–9 = x 10; 10, 11 = x 25.

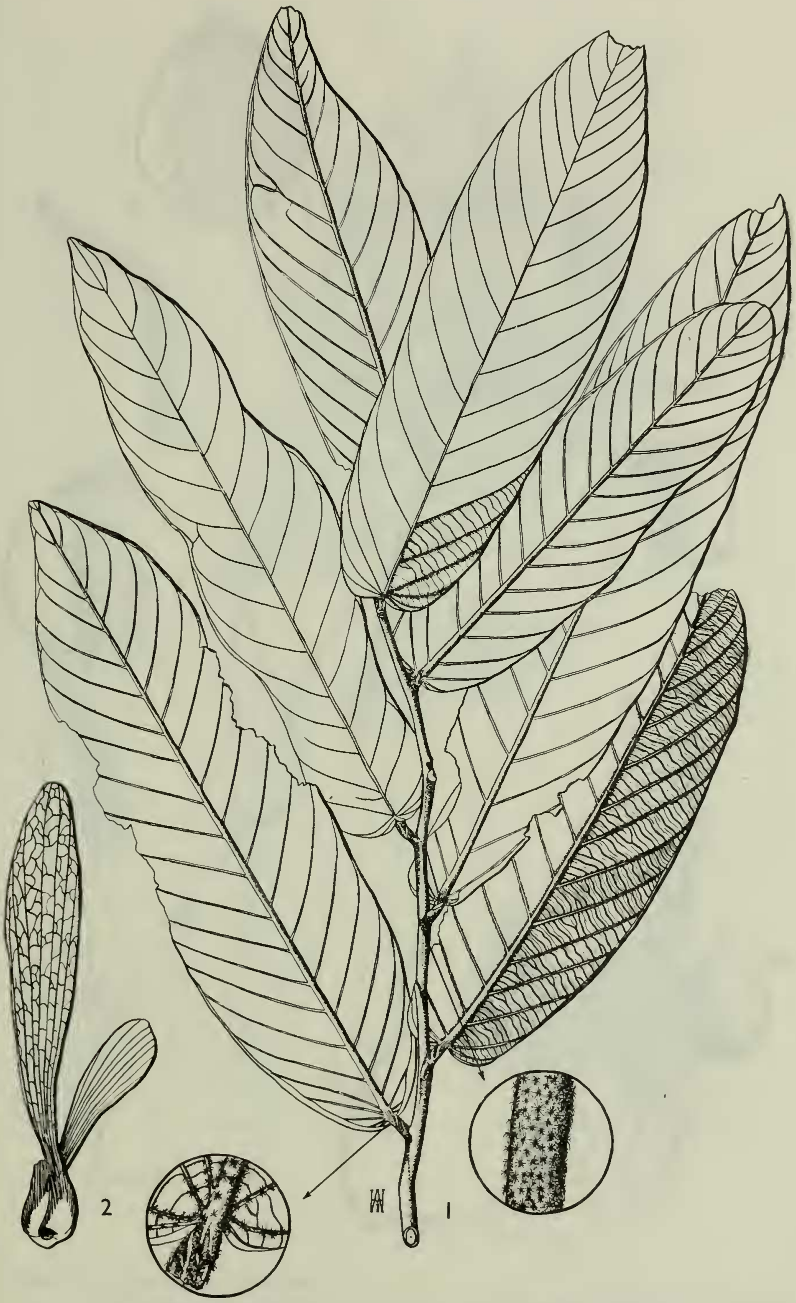


Plate 18. *Hopea bullatifolia*.
1, leafy branchlet (x ½); 2, fruit (x 2/3). From S. 522.

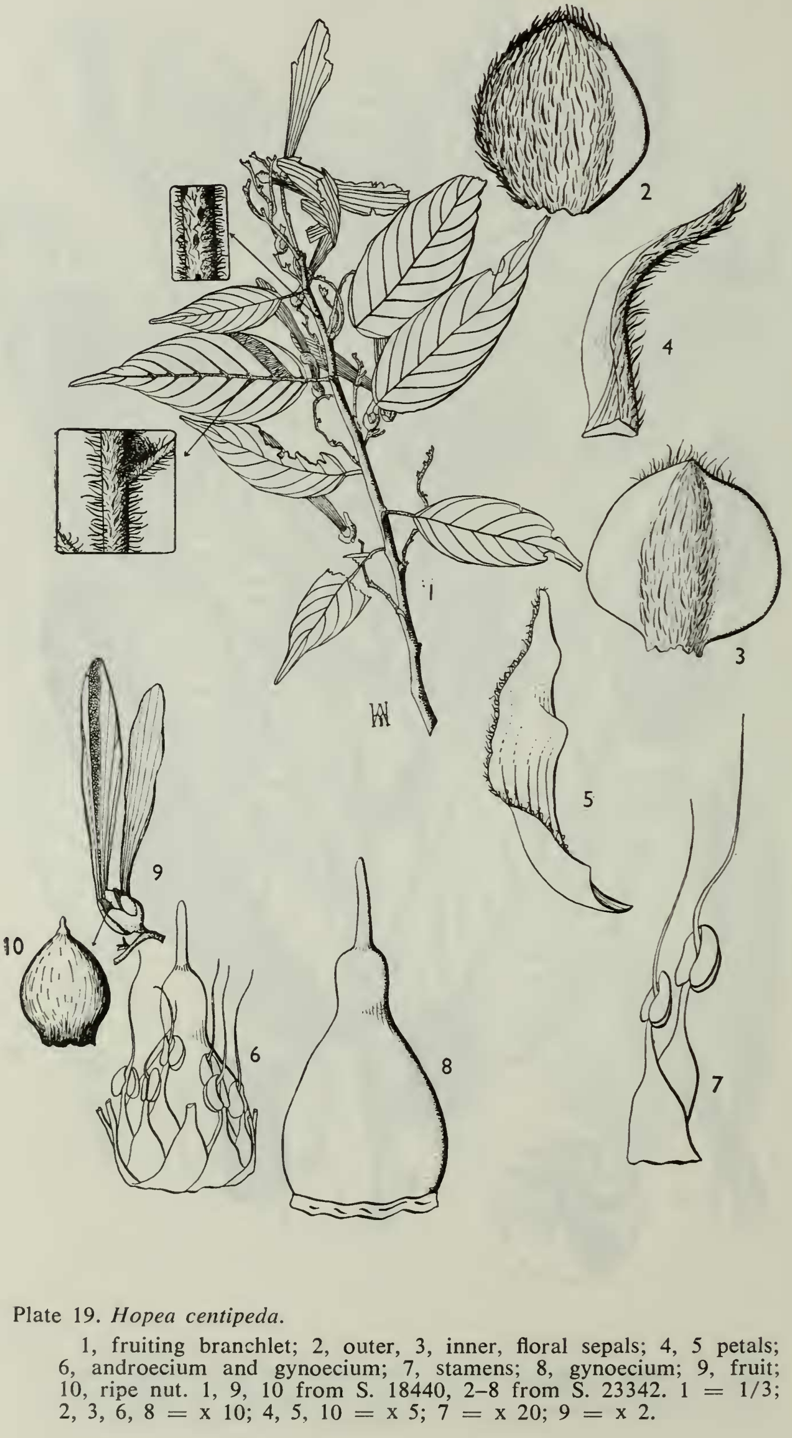


Plate 19. *Hopea centipeda.*

1, fruiting branchlet; 2, outer, 3, inner, floral sepals; 4, 5 petals; 6, androecium and gynoecium; 7, stamens; 8, gynoecium; 9, fruit; 10, ripe nut. 1, 9, 10 from S. 18440, 2–8 from S. 23342. 1 = 1/3; 2, 3, 6, 8 = x 10; 4, 5, 10 = x 5; 7 = x 20; 9 = x 2.

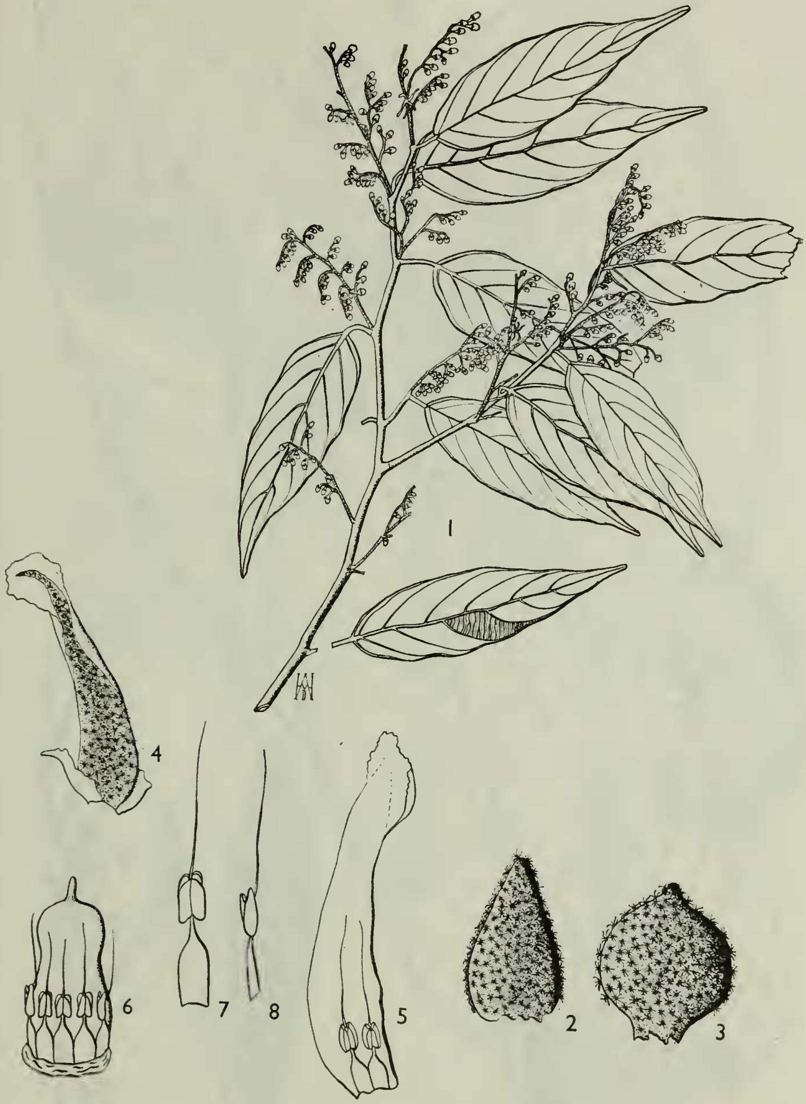


Plate 20. *Hopea depressinerva.*

1, flowering branchlets; 2, outer, 3, inner floral sepals; 4, petal; 5, petal with stamens; 6, androecium and gynoecium; 7, frontal; 8, lateral view of stamens. From S. 15439. 1 = x ½; 2–6 = x 10; 7, 8 = x 20.

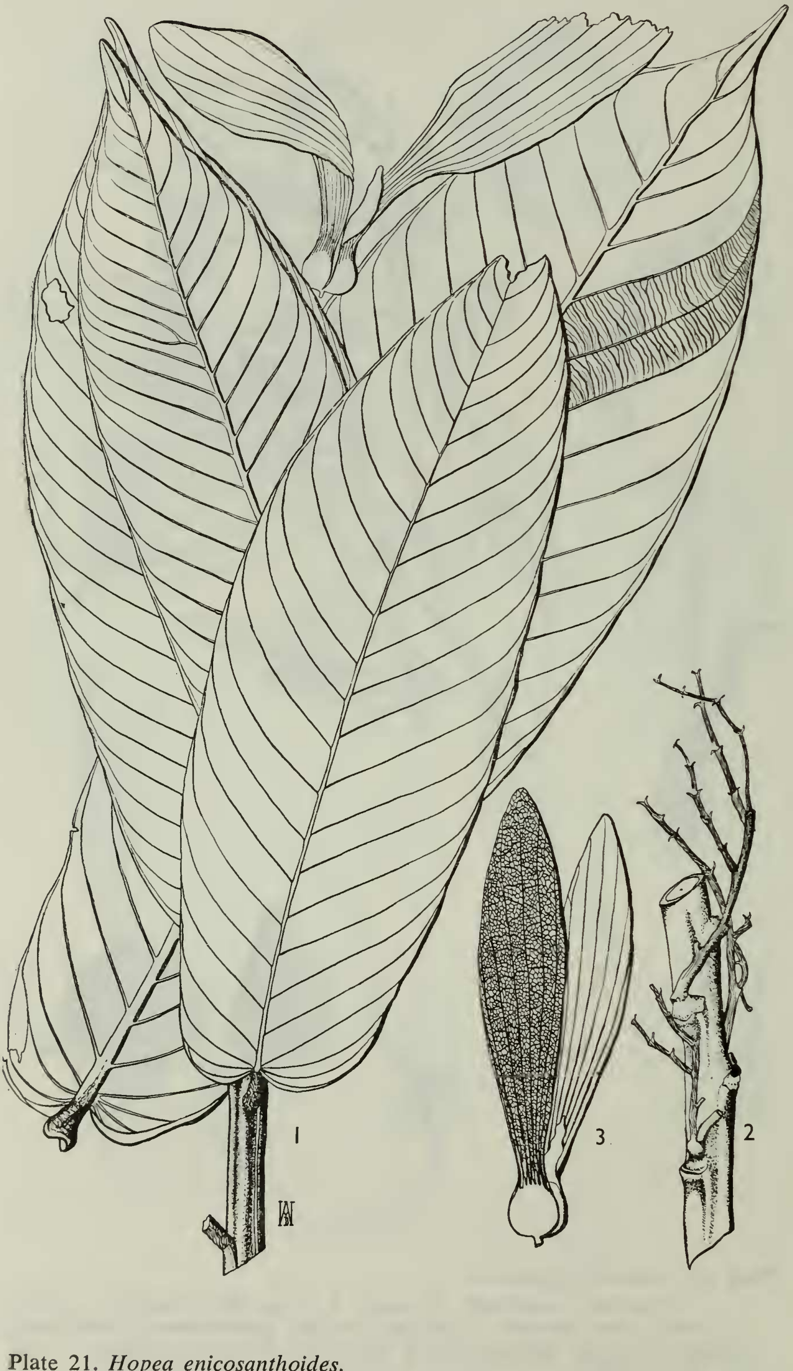


Plate 21. *Hopea enicosanthoides.*

1, fruiting branchlet; 2 fruiting inflorescences; 3, fruit. From S. 18116. (x ½).

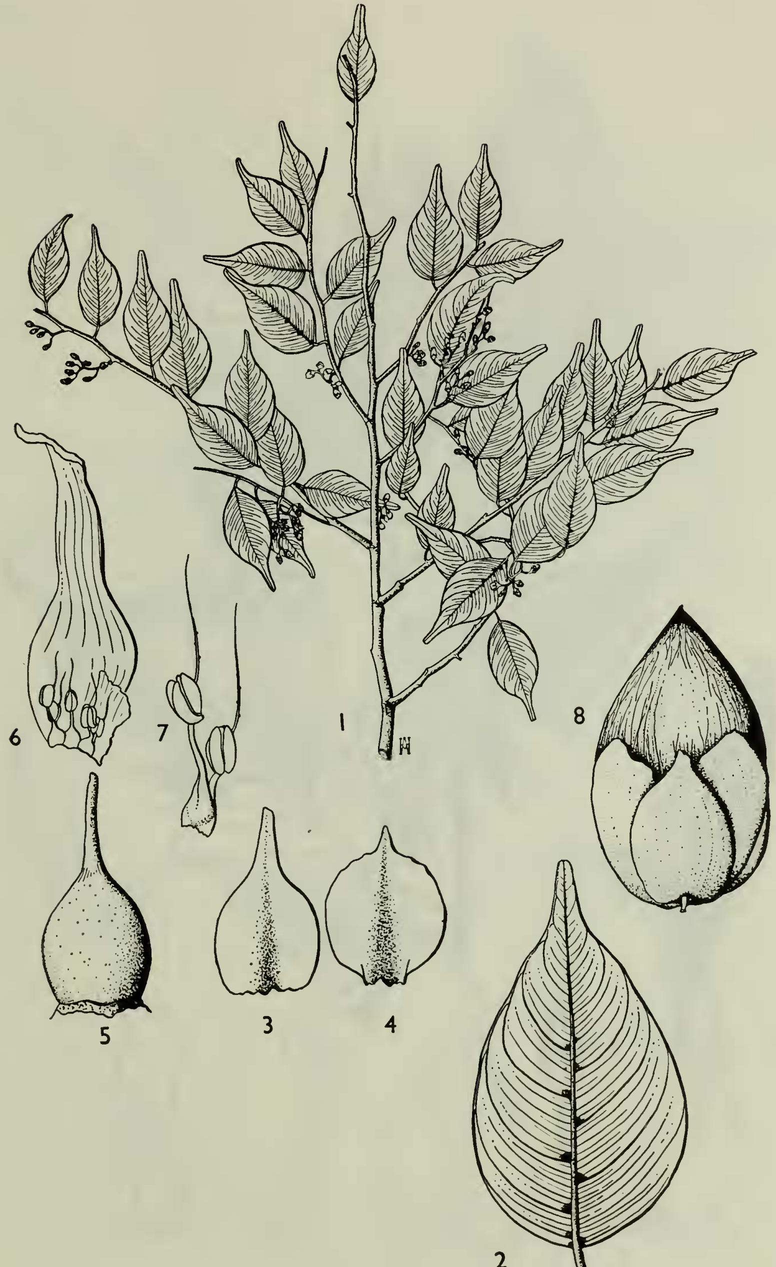


Plate 22. *Hopea kerangasensis.*

1, flowering twig; 2, fallen leaf; 3, outer, 4, inner, floral sepals; 6, petal with stamens; 7, stamens; 5, gynoecium; 8, fruit 1–7 from S. 21299; 8 from S. 8944. 1 = x ½; 2 = x 2; 3–4, 6 = x 8; 5, 7 = x 20; 8 = x 5.

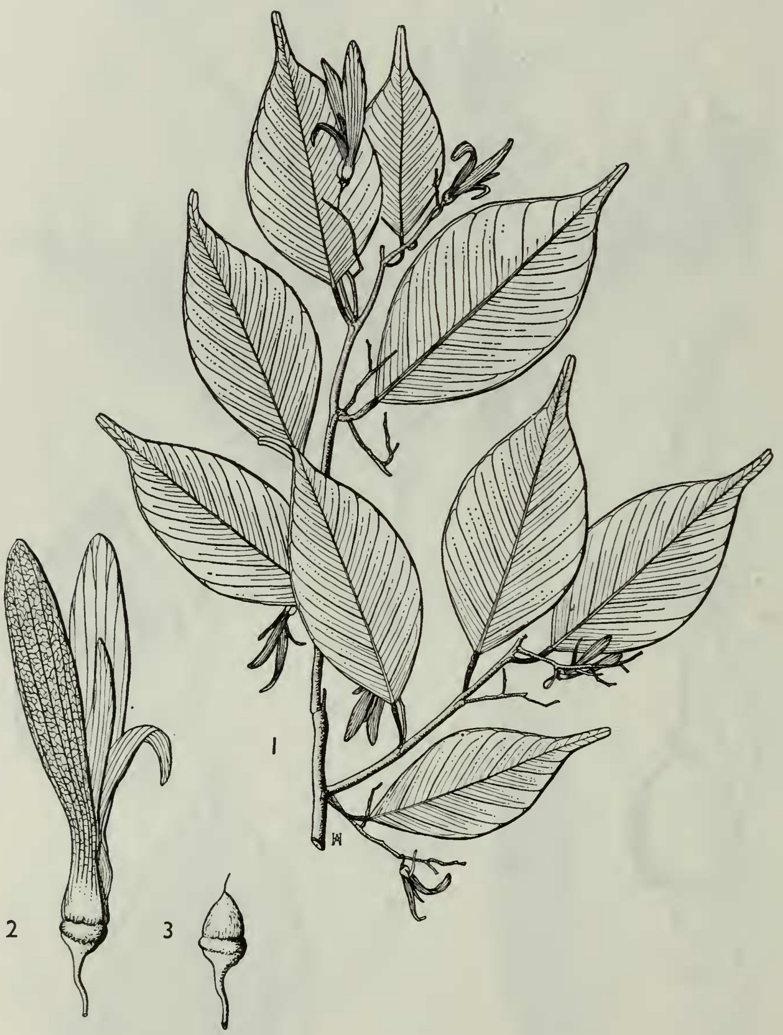


Plate 23. *Hopea longirostrata.*

1, fruiting twig; 2 = fruit; 3 = nut. From S. 17742. 1 = x ½; 23 = x 2.

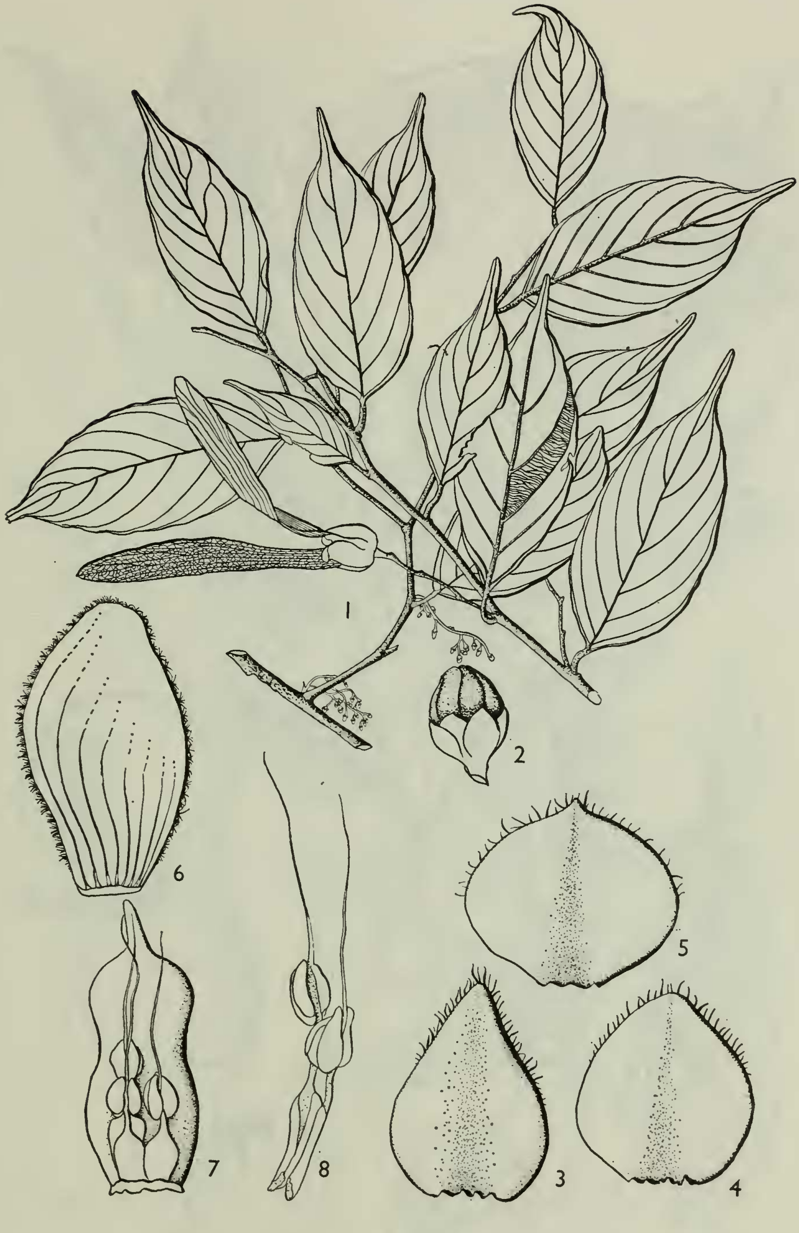


Plate 24. *Hopea megacarpa.*

1, flowering and fruiting twigs; 2, flower bud; 3, outer, 4, 5, inner, floral sepals; 6, petal; 7, androecium and gynoecium; 8, stamens. Fruiting twig from SA. 639, otherwise from S. 14743. 1 = x $\frac{1}{2}$; 2 = x 4; 3 = x 5, 7 = x 20; 6 = x 15; 8 = x 30.

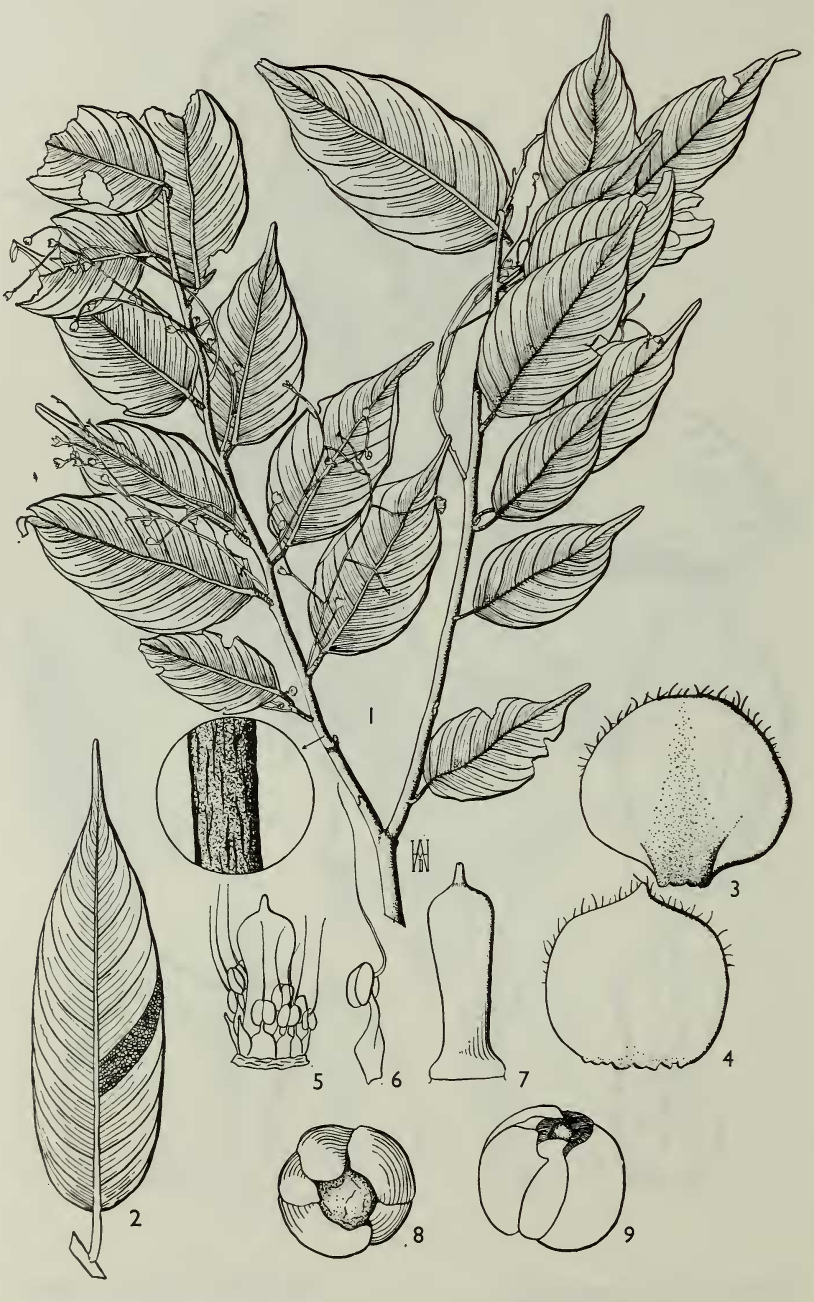


Plate 25. *Hopea mesuoides.*

1, flowering branchlet; 2, leaf of young tree; 3, inner, 4, outer floral sepals; 5, androecium and gynoecium; 6, stamen; 7, gynoecium; 8, 9, fruit. 1, 3–7 from S. 11247; 2, 8, 9 from S. 15551. 1, 2 = x 1/3; 3, 4, 6, 7 = x 10; 5 = x 7; 8, 9 = x 1.

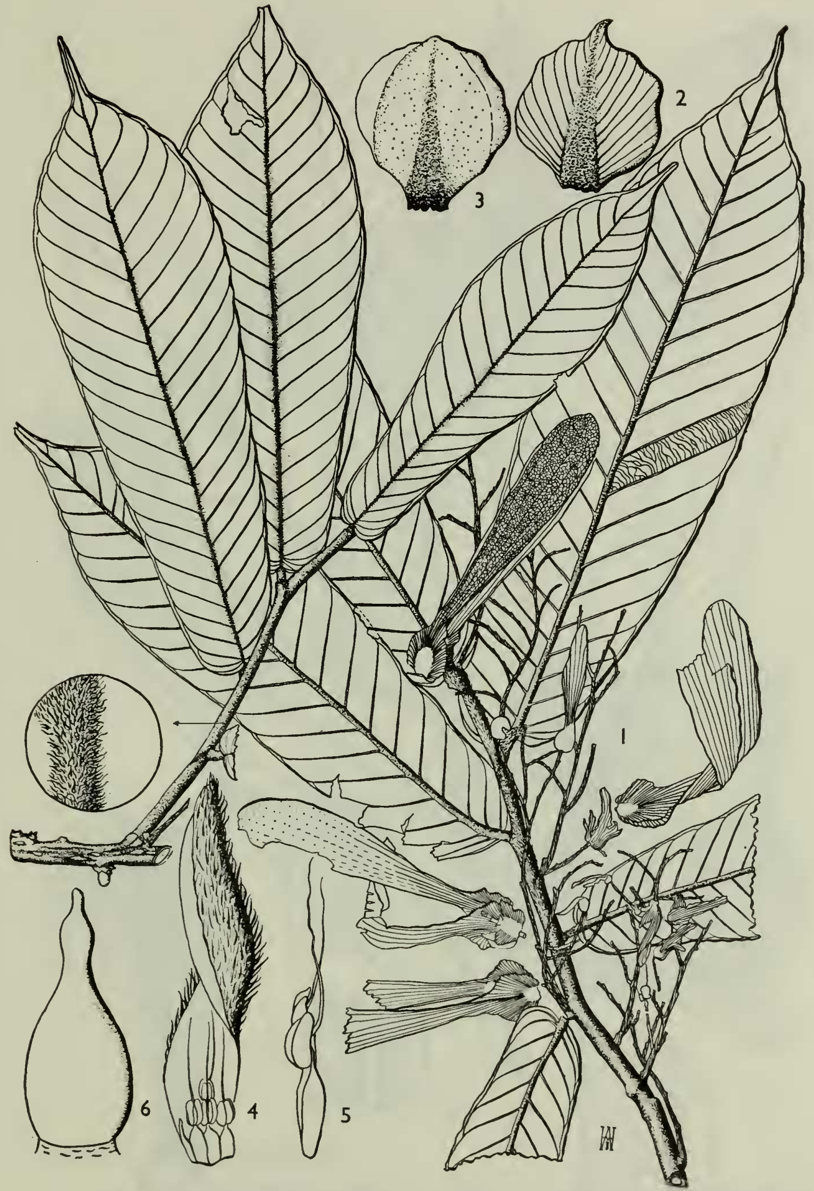


Plate 26. *Hopea pterygota.*

1, fruiting branchlet; 2, outer, 3, inner floral sepals; 4, petal and stamens; 5, lateral view of stamens; 6, gynoecium. From S. 15206. 1 = x ½; 2–4 = x 10; 5–6 = x 20.

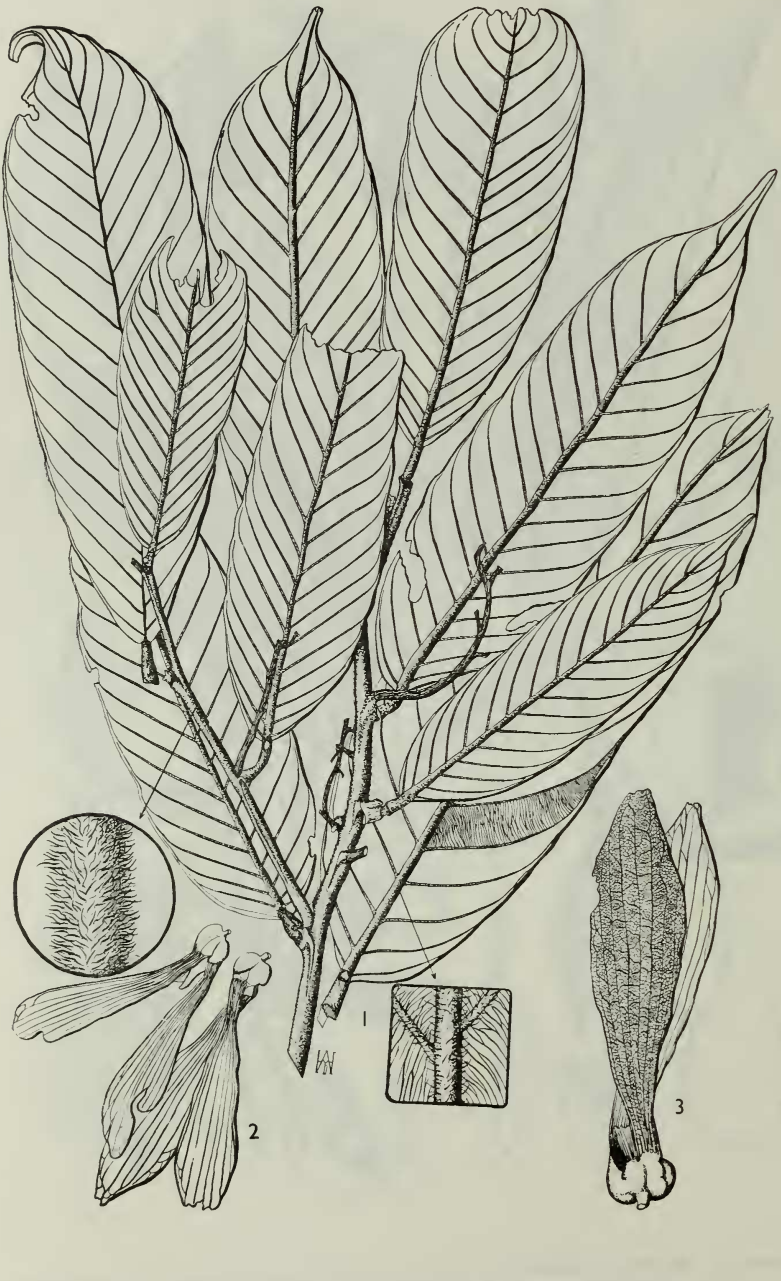


Plate 27. *Hopea tenuinervula.*
1, leafy branchlet, 2, 3, fruit. From S. 9616. 1, 2 = x ½; 3 = x 1.

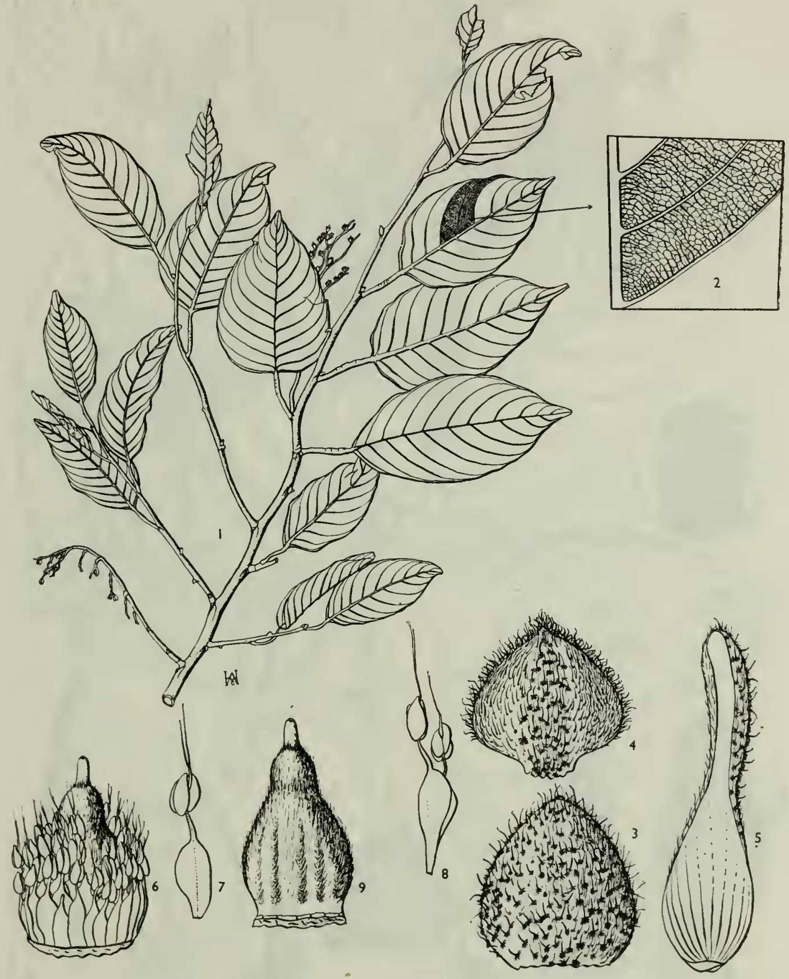


Plate 28. *Shorea brunnescens.*

1, flowering twig; 2, detail of lamina nervation below; 3, outer, 4, inner, flower sepals; 5, petal, 6, ovary and gynoecium; 7, 8, stamens; 9, gynoecium. From S. 15218, 1 = x 1/3, 2 = x 1, 5, 6, 9 = x 10; 3, 4, 7, 8 = x 15.

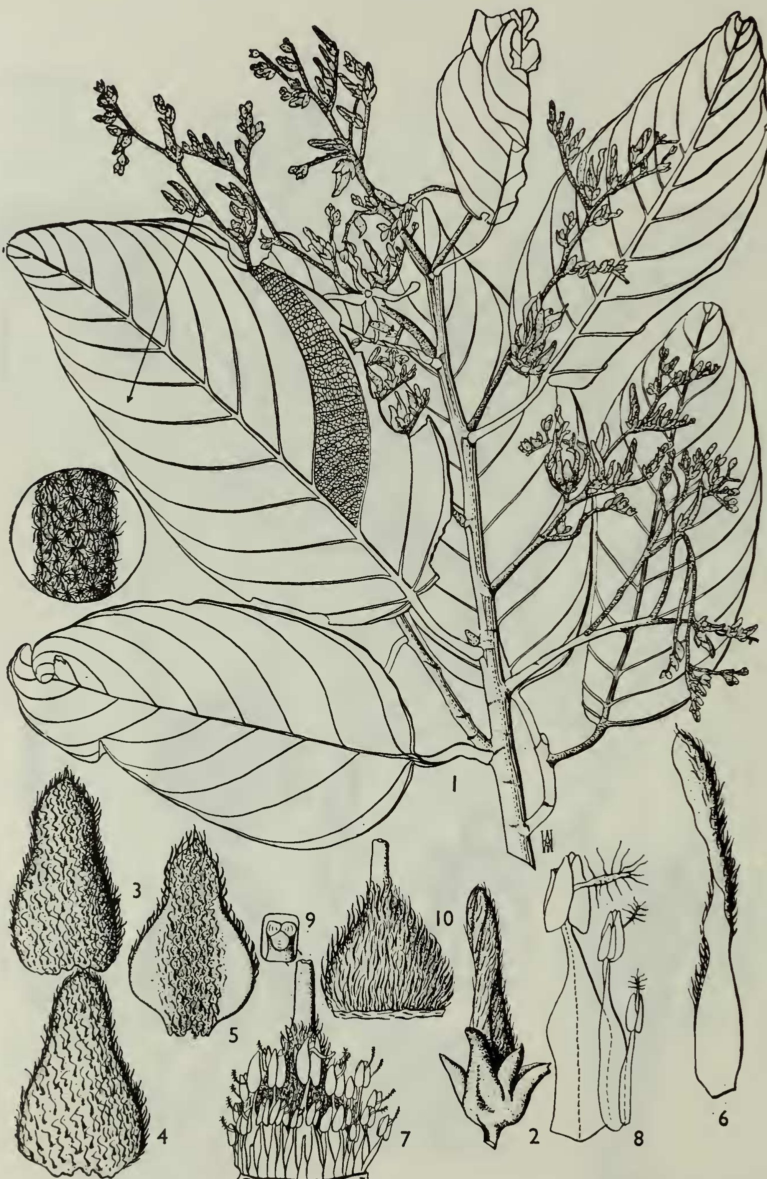


Plate 29. *Shorea lunduensis.*

1, flowering branchlet; 2, flower bud; 3, 4, outer, 5, inner sepals; 6, petal; 7, androecium and gynoecium; 8, stamens, frontal view; 9, stigma; 10, gynoecium. From S. 15396. 1 = x ½; 2 = x 4; 3–5 = x 15; 6, 7 = x 10; 8 = x 20.

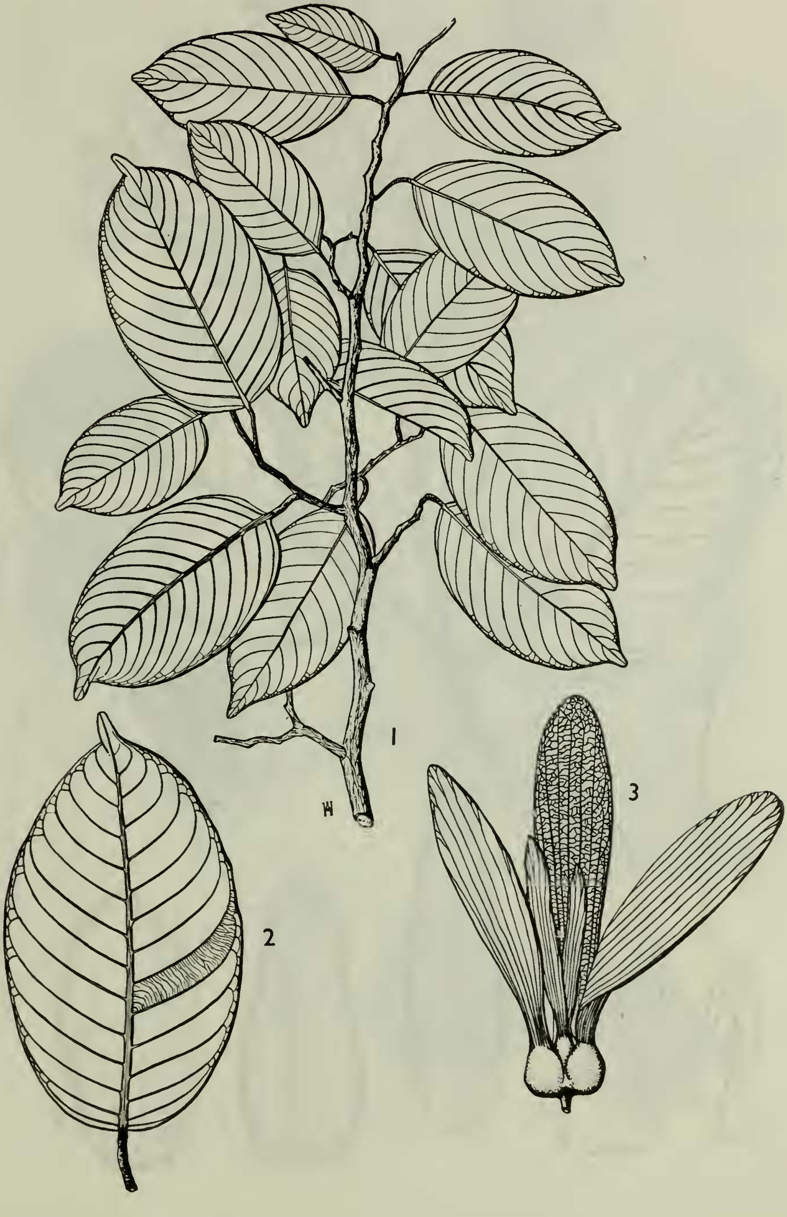


Plate 30. *Shorea agami* ssp. *diminuta*.

1, leafy twig; 2, fallen leaf; 3, fruit. From S. 25027. 1, 3 = x ½; 2 = x 1.

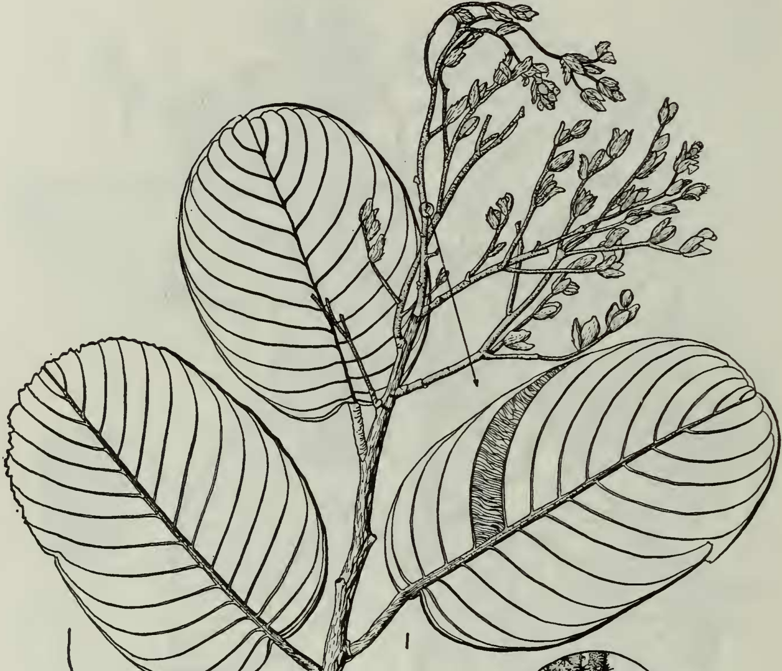


Plate 31. *Shorea cordata.*

1, flowering branchlet; 2, detail of young twig; 3, outer, 4, inner, floral sepals; 5, petal; 6, stamens and gynoecium; 7, posterior view of stamen. From SA. 678. 1 = x ½; 2 = x 3; 3–6 = x 10; 7 = x 15.

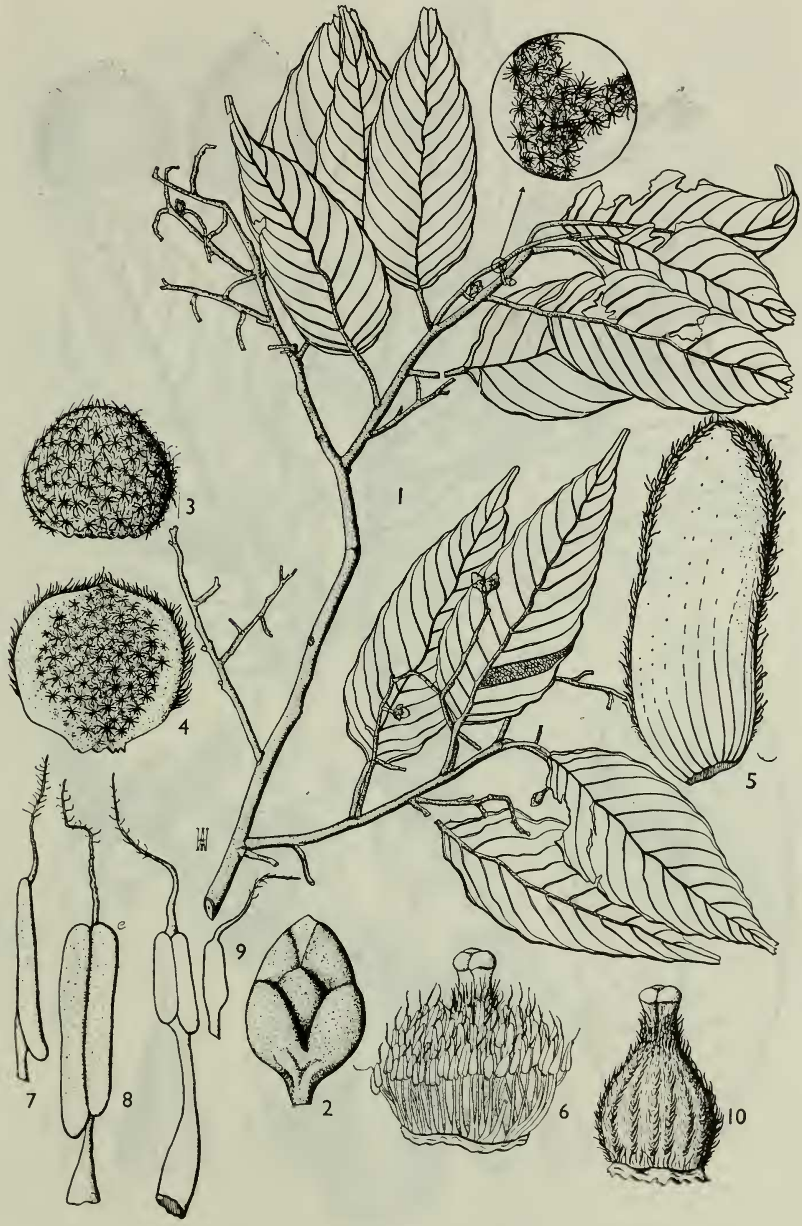


Plate 32. *Shorea polyandra.*

1, flowering branchlet; 2, flower bud; 3, outer, 4 inner floral sepal; 5, petal; 6, androecium and gynoecium; 7, lateral, 8, frontal view of outer, 9 same of inner, stamens; 10, gynoecium. From S. 10171. 1 = x ½; 2 = x 5; 3–6, 10, = x 10; 7–9 = x 30.

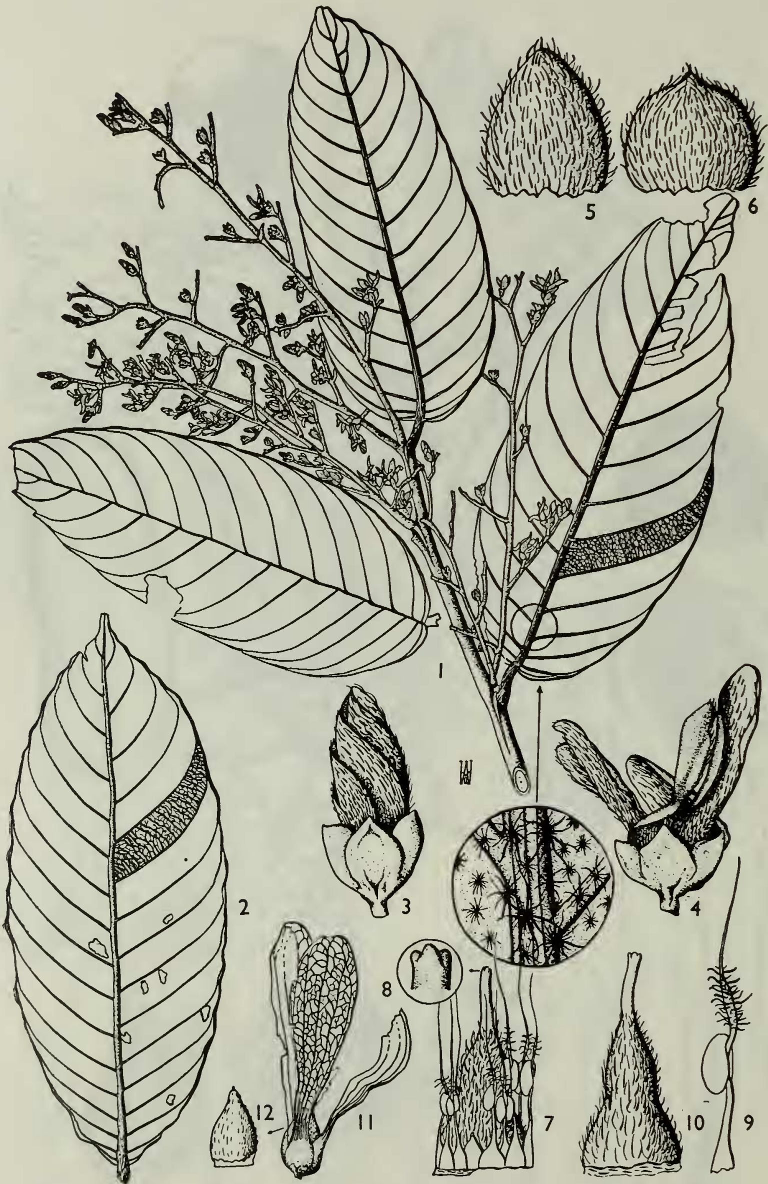


Plate 33. *Shorea alutacea.*

1, flowering branchlet; 2, fallen leaf; 3, flower bud; 4, opened flower; 5, outer, 6, inner floral sepal; 7, androecium and gynoecium; 8, stigma; 9, stamen, lateral view; 10, gynoecium; 11, fruit; 12, ripe nut. 1–10 from S. 7975; 11, 12 from S. 10170. 1, 2, 11, 12 = x ½; 3, 4 = x 5; 5–7, 10 = x 10; 8 = x 40; 9 = x 15.

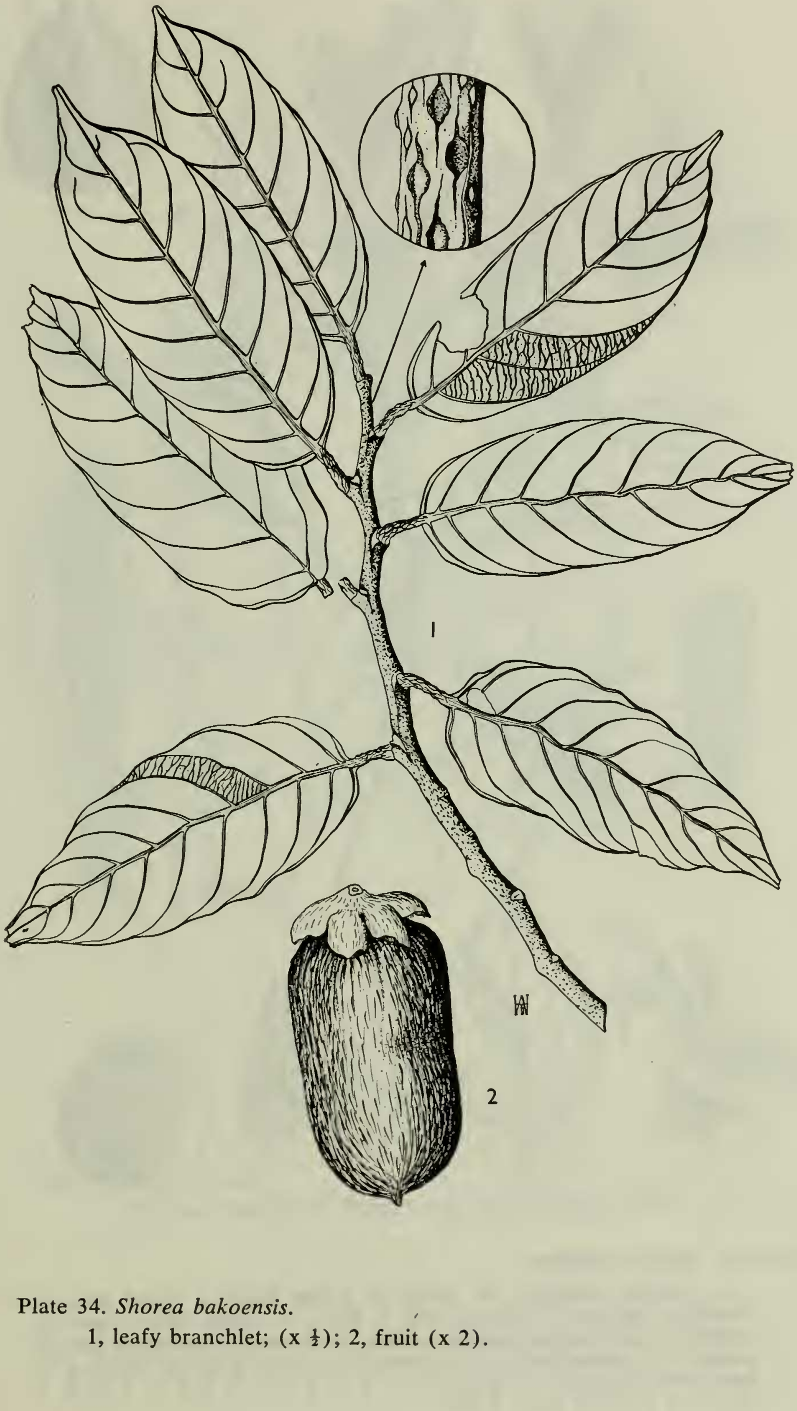


Plate 34. *Shorea bakoensis*.
1, leafy branchlet; (x ½); 2, fruit (x 2).

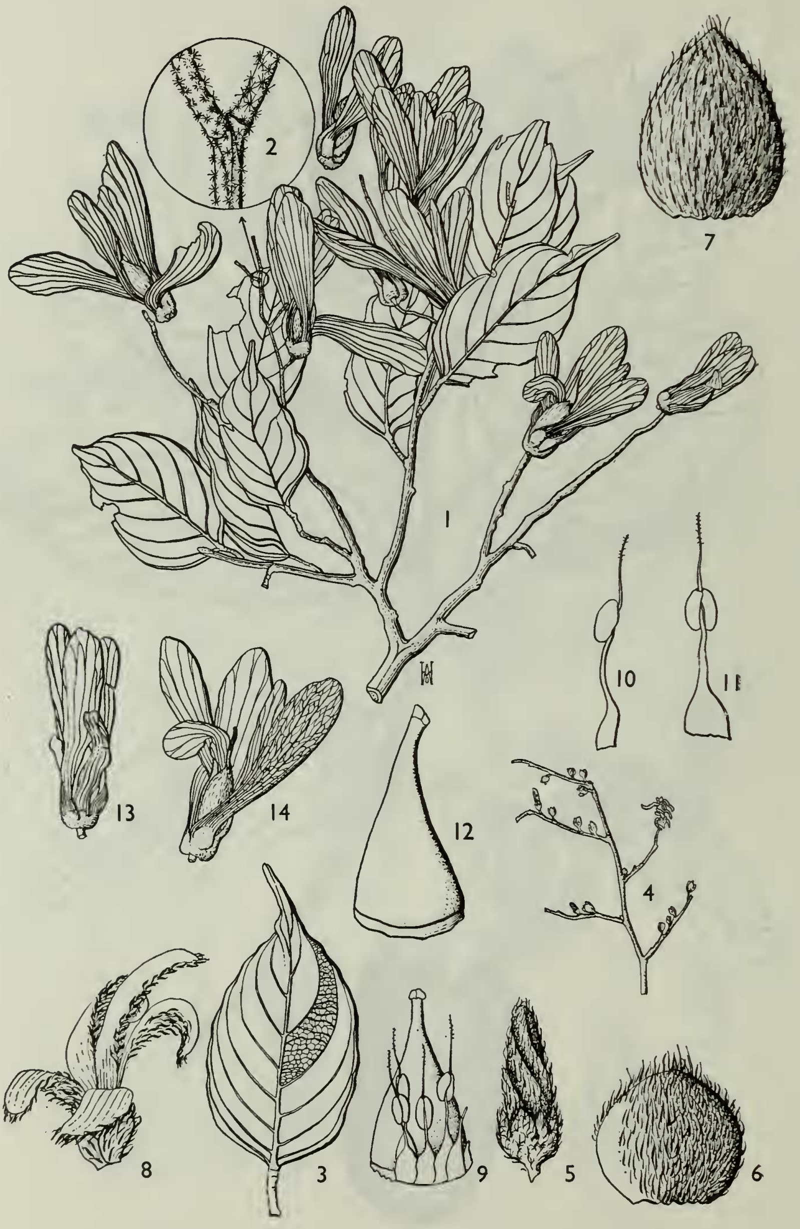


Plate 35. *Shorea cuspidata.*

1, fruiting branchlet; 2, detail of young twig; 3, fallen leaf; 4, flowering raceme; 5, flower bud; 6 inner, 7, outer floral sepal; 8, corolla; 9, androecium and gynoecium; 10, lateral; 11, posterior view of stamen; 12, gynoecium; 13, 14, fruit. 1–3, 13, 14 from S. 15258, 4–12 from tree no. 603. 1, 3, 4, 13, 14 = x ½; 2 = x 2; 5, 8 = x 8; 6, 7, 10, 11 = x 25; 9, 12 = x 15.

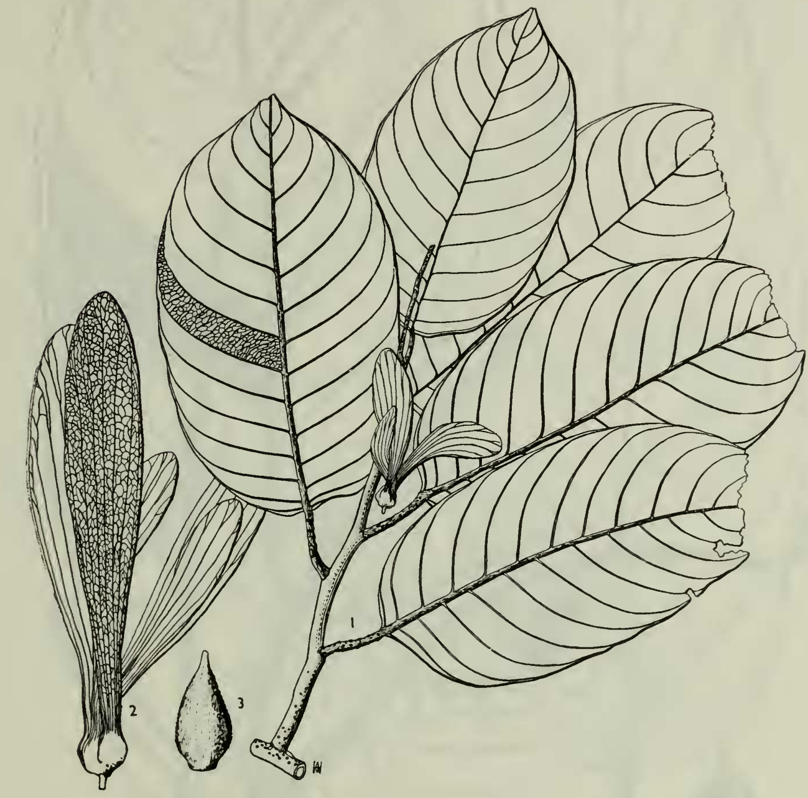


Plate 36. *Shorea iliasii.*

1, fruiting branchlet; 2 fruit; 3, ripe nut. From S. 15102. 1, 2 = 1/3; 3 = x ½.

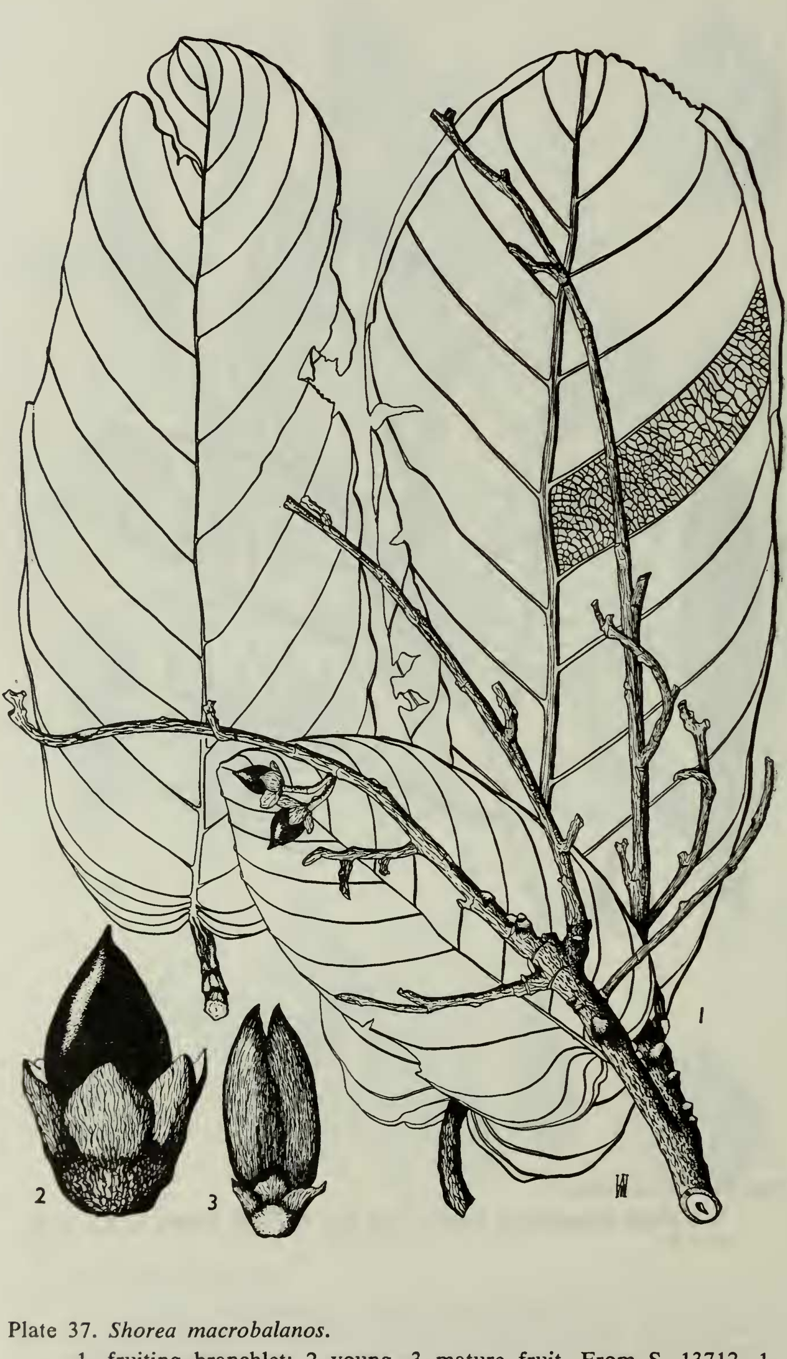


Plate 37. *Shorea macrobalanos.*

1, fruiting branchlet; 2 young, 3 mature fruit. From S. 13712. 1, 3 = x ½; 2 = x 1.

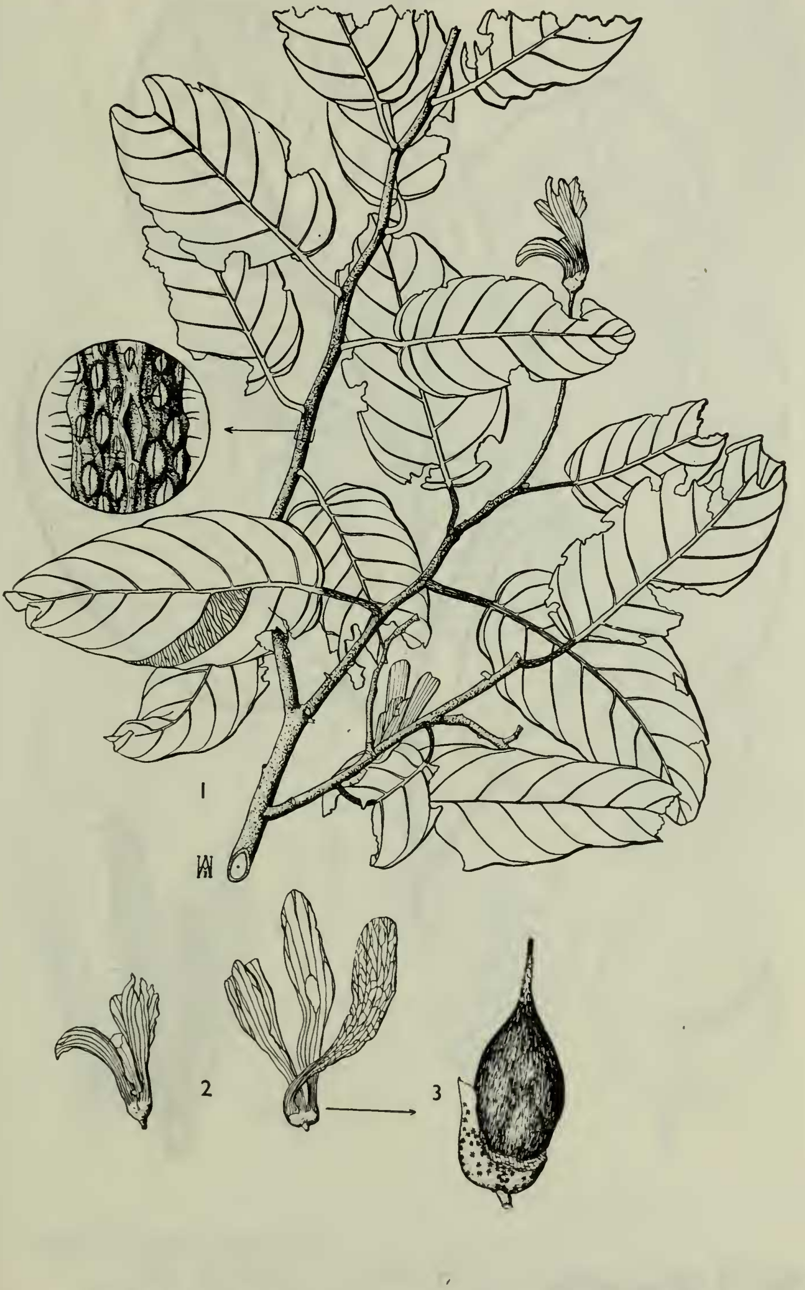


Plate 38. *Shorea mujongensis.*

1, fruiting twig; 2, fruits; 3, ripe nut; from S. 19038. 1, 2 = x ½; 3 = x 2.

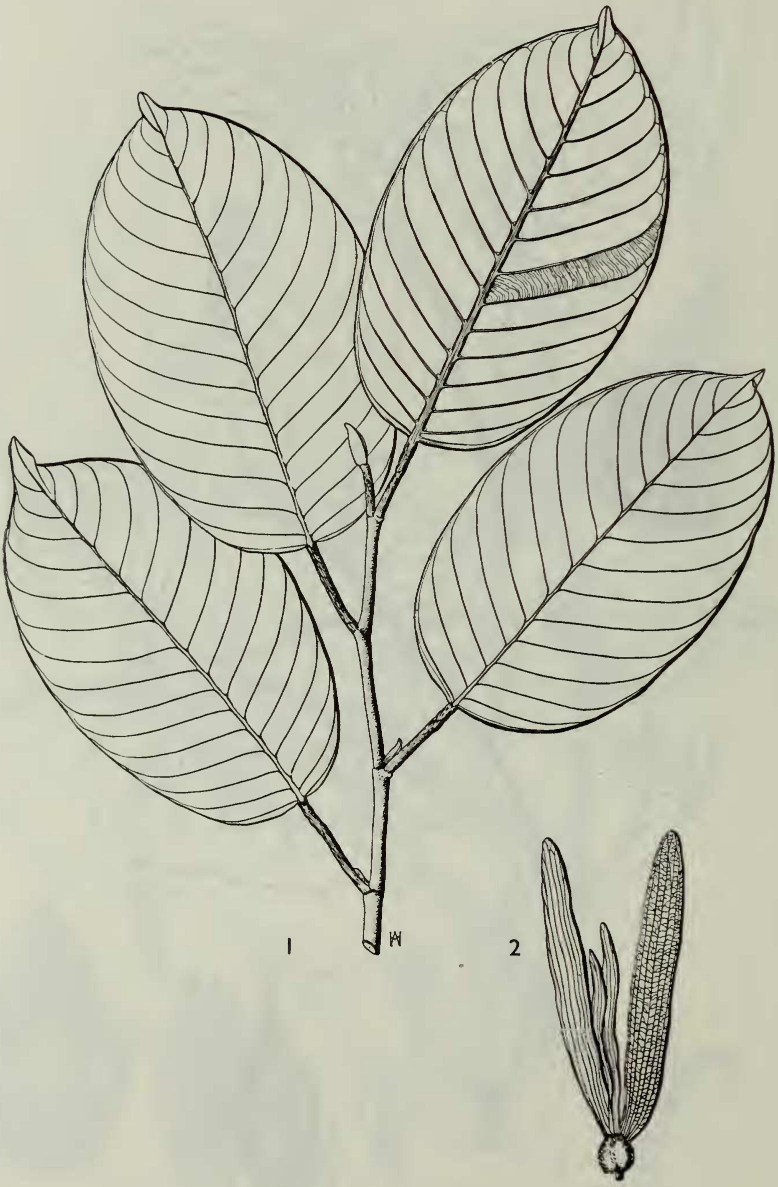


Plate 39. *Shorea carapae*.

1, leafy twig; 2, young fruit. 1 from S. 13991; 2 from SAN. 39323; 1, 2 =x ½.

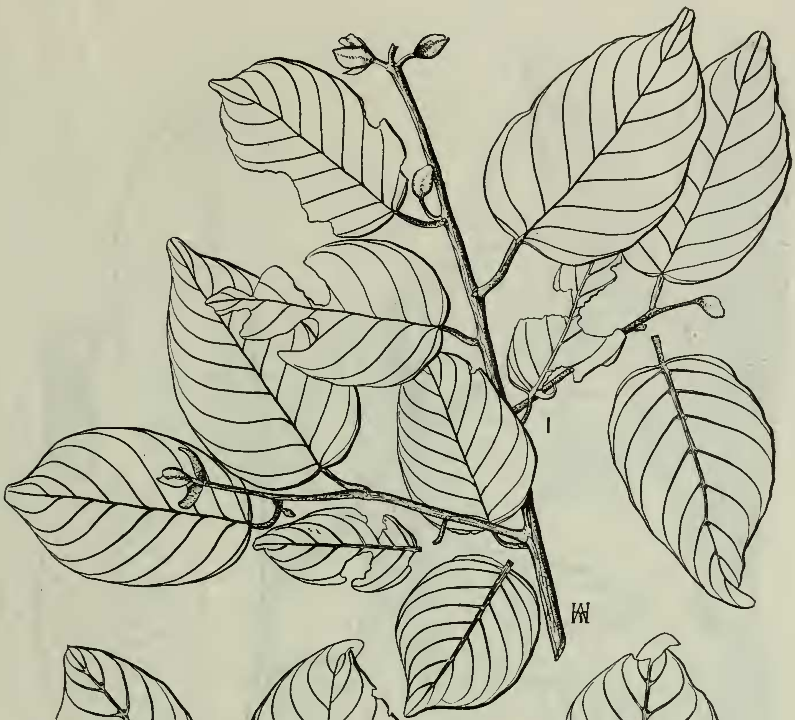


Plate 40. *Shorea foraminifera.*

1, leafy branchlet; 2–6, fallen leaves; 7, 8, fruit; 9, detail of outer surface of fruit calyx lobe. 1 from Brun. 243; 2–9 from S. 1916. 1–8 = x ½; 9 = x 1.

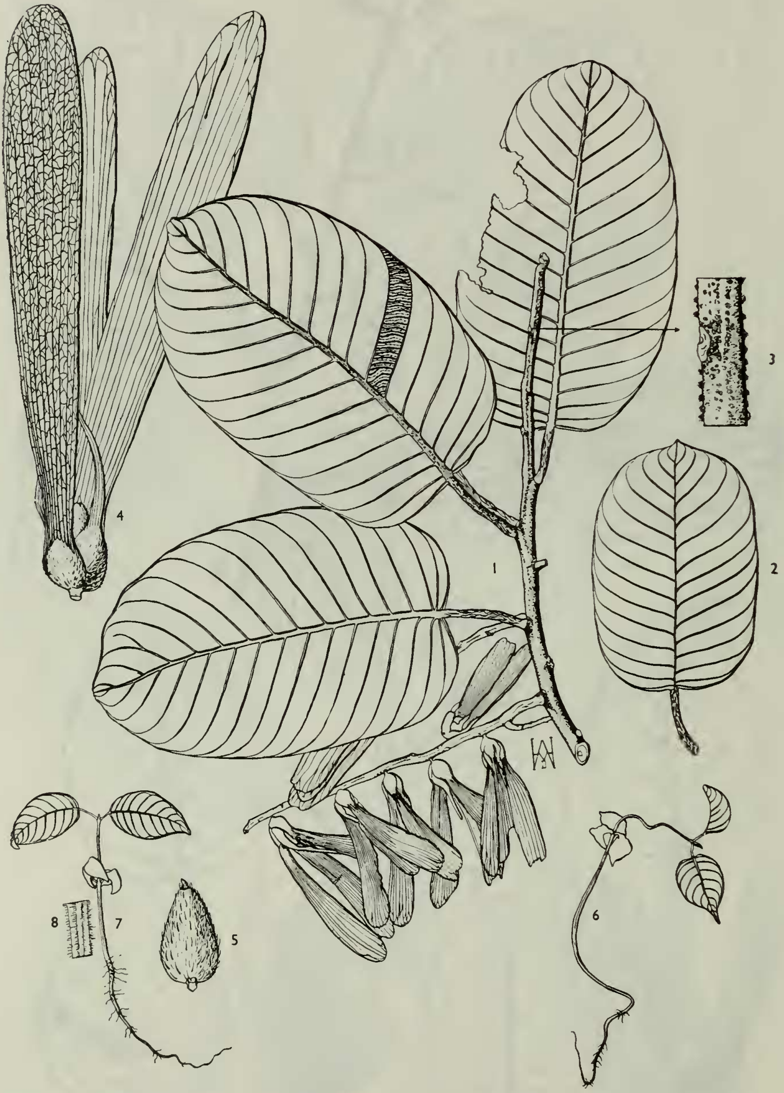


Plate 41. *Shorea pallidifolia.*

1, fruiting branchlet; 2, fallen leaf; 3, detail of young twig; 4, fruit; 5, ripe nut; 6, 7, germinating seedlings; 8, detail of seedling stem. From S. 16054. 1, 2, 6, 7 = x 1/3; 3–5, 8 = x 1.5.

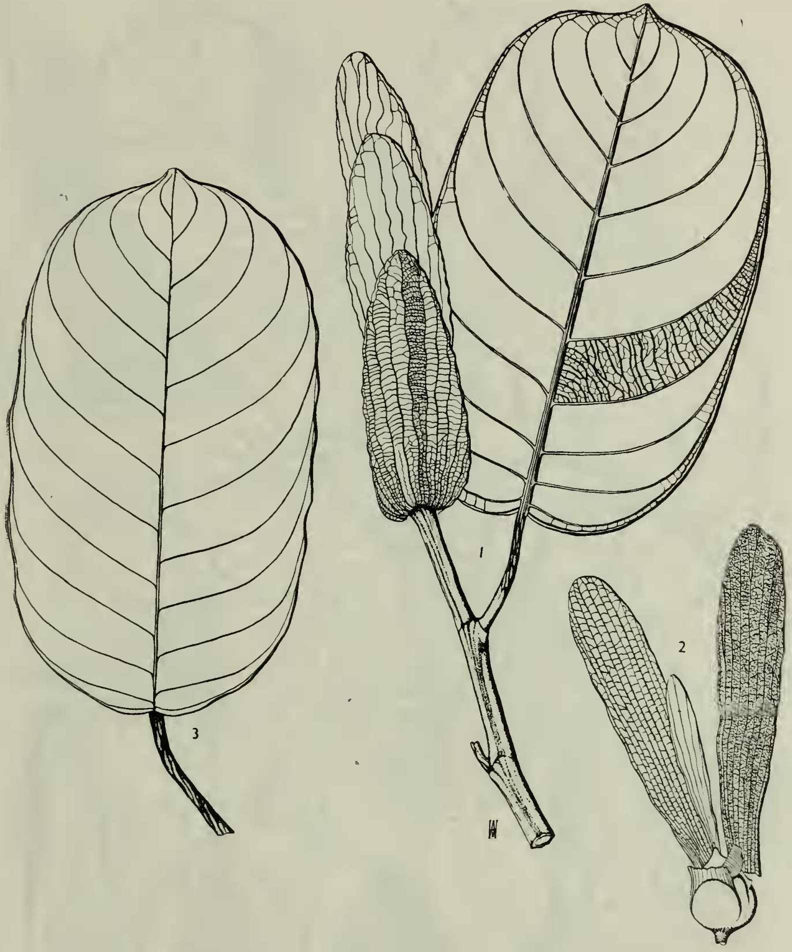


Plate 42. *Shorea praestans.*

1, leafy branchlet; 2, fallen leaf; 3, young fruit. 1, 3 from S. 19598; 2 from s.n. (Brunig). x 1/4.

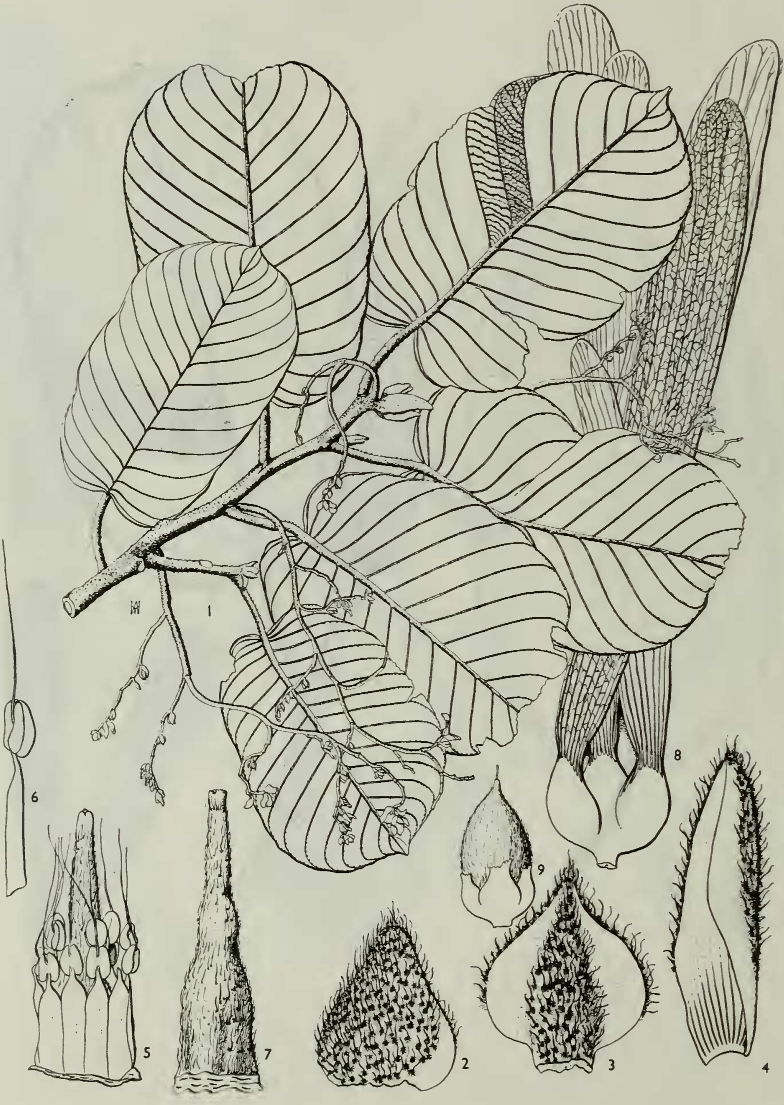


Plate 43. *Shorea pubistyla.*

1, flowering branchlet; 2, outer, 3, inner, floral sepals; 4, petal; 5, androecium and gynoecium; 6, lateral view of stamen; 7, gynoecium; 8, fruit; 9, ripe nut. 1–7 from S. 14930; 8, 9 from FA. 1301. 1, 9 = x 1/3; 2, 3, 6 = x 15; 4, 5, 7 = x 10; 8 = x 1.

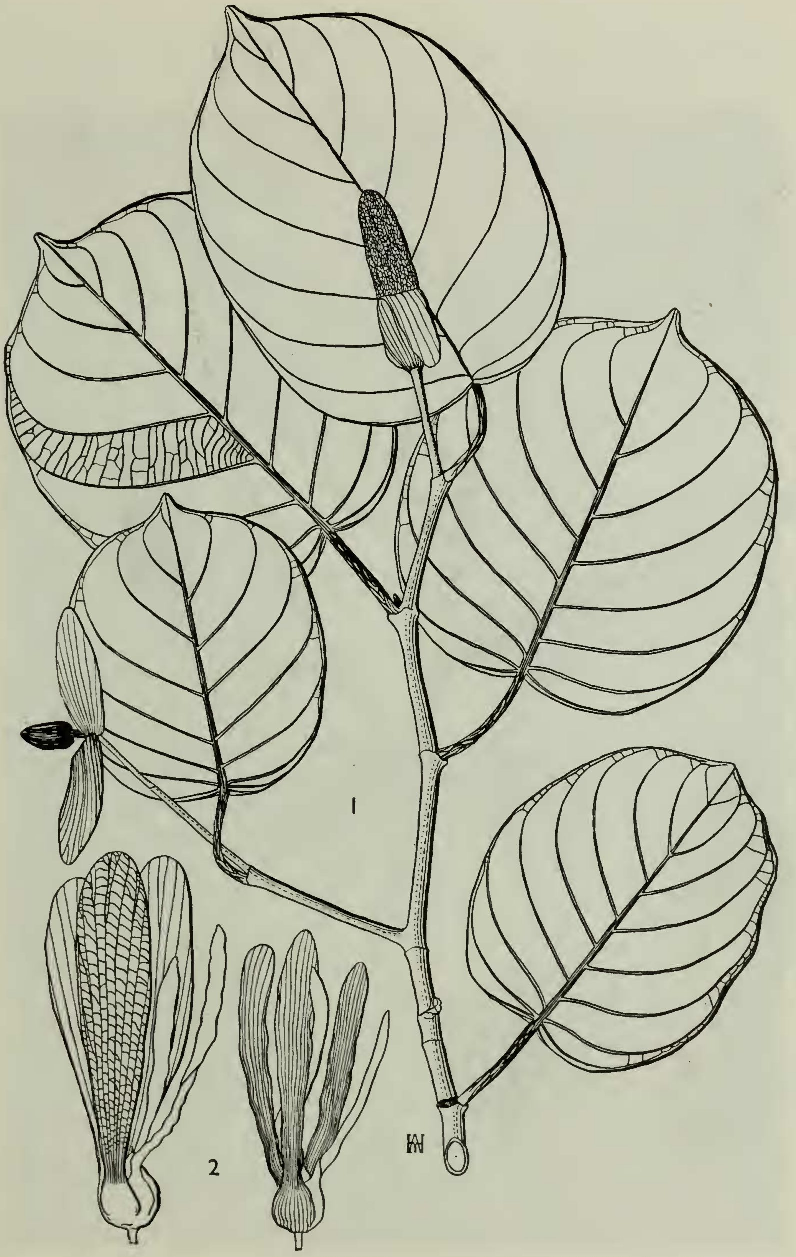


Plate 44. *Shorea rotundifolia.*

1, leafy branch; 2 young fruit. 1 from S. 22051; 2 from S. 9470. x 1/3.

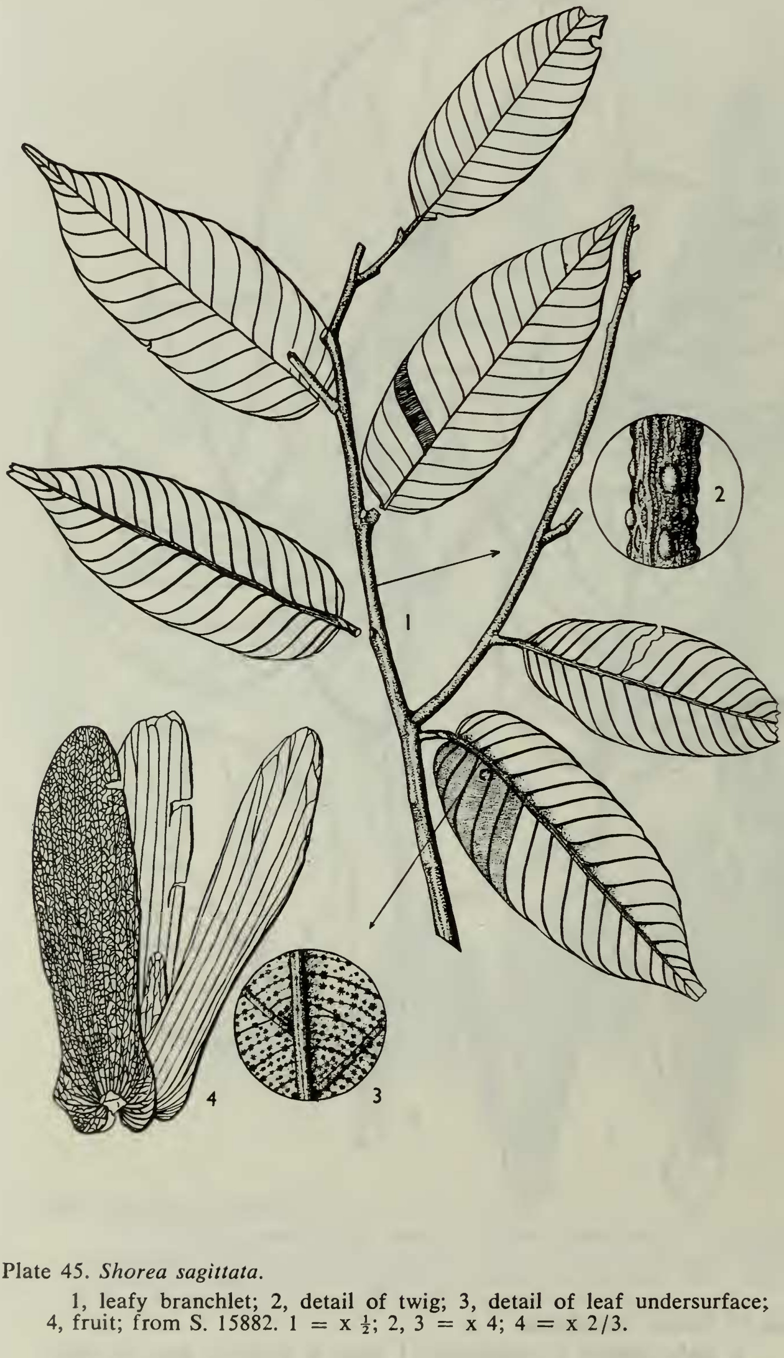
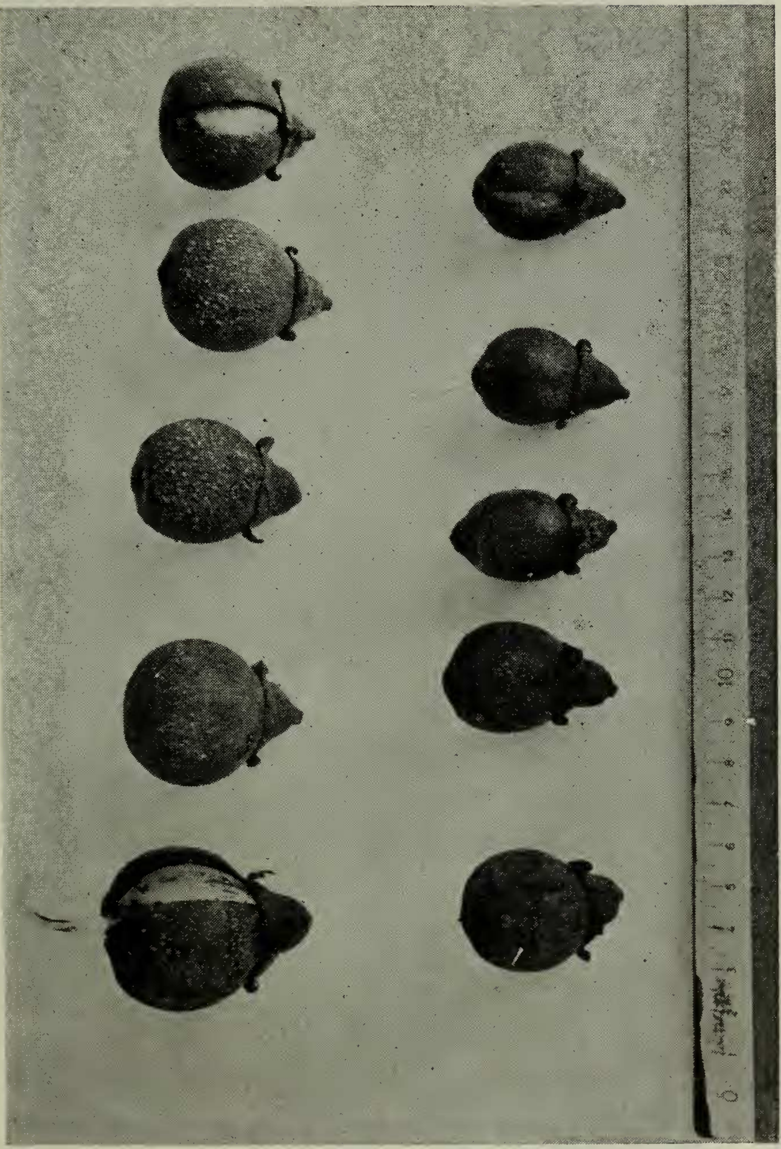
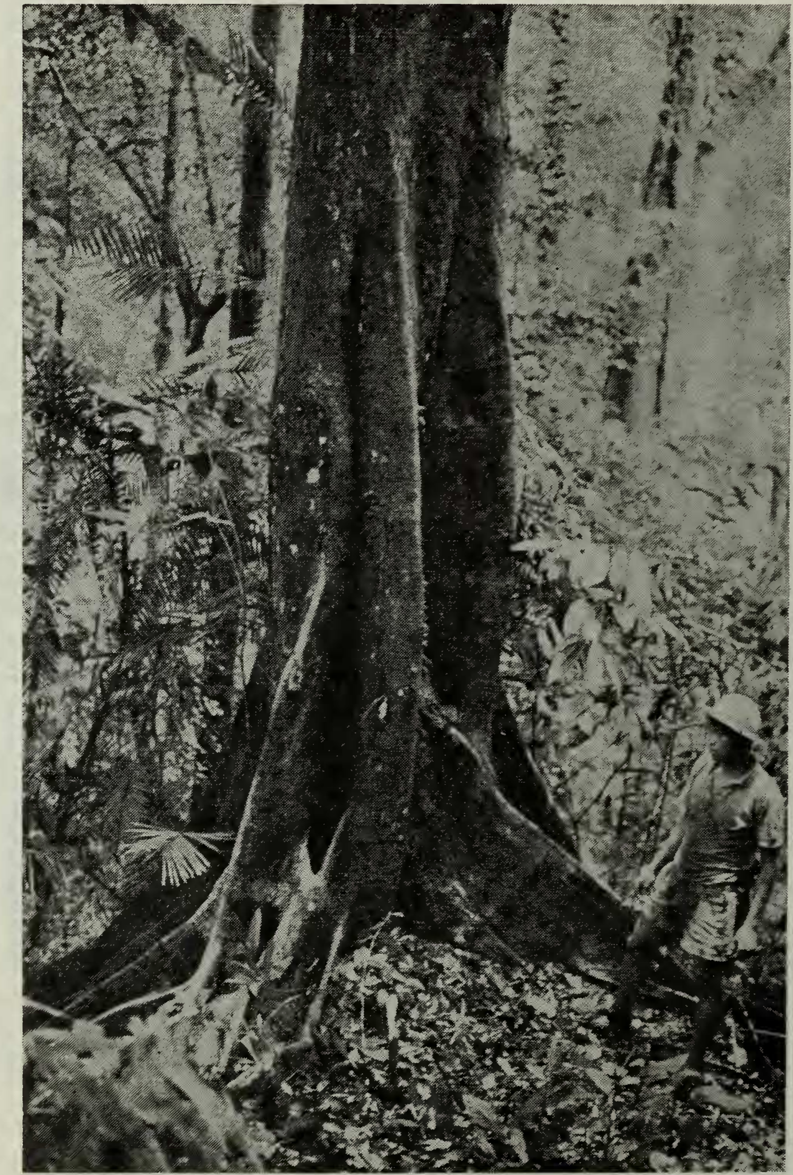


Plate 45. *Shorea sagittata.*

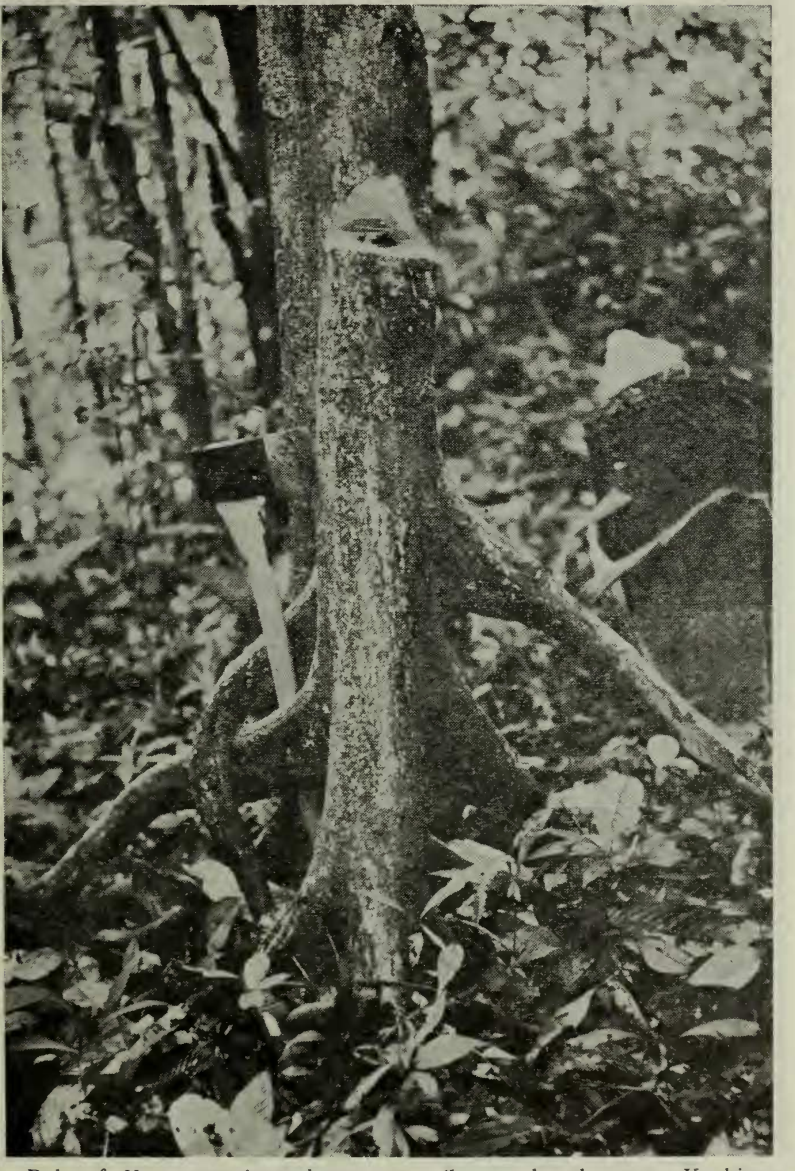
1, leafy branchlet; 2, detail of twig; 3, detail of leaf undersurface; 4, fruit; from S. 15882. 1 = x ½; 2, 3 = x 4; 4 = x 2/3.



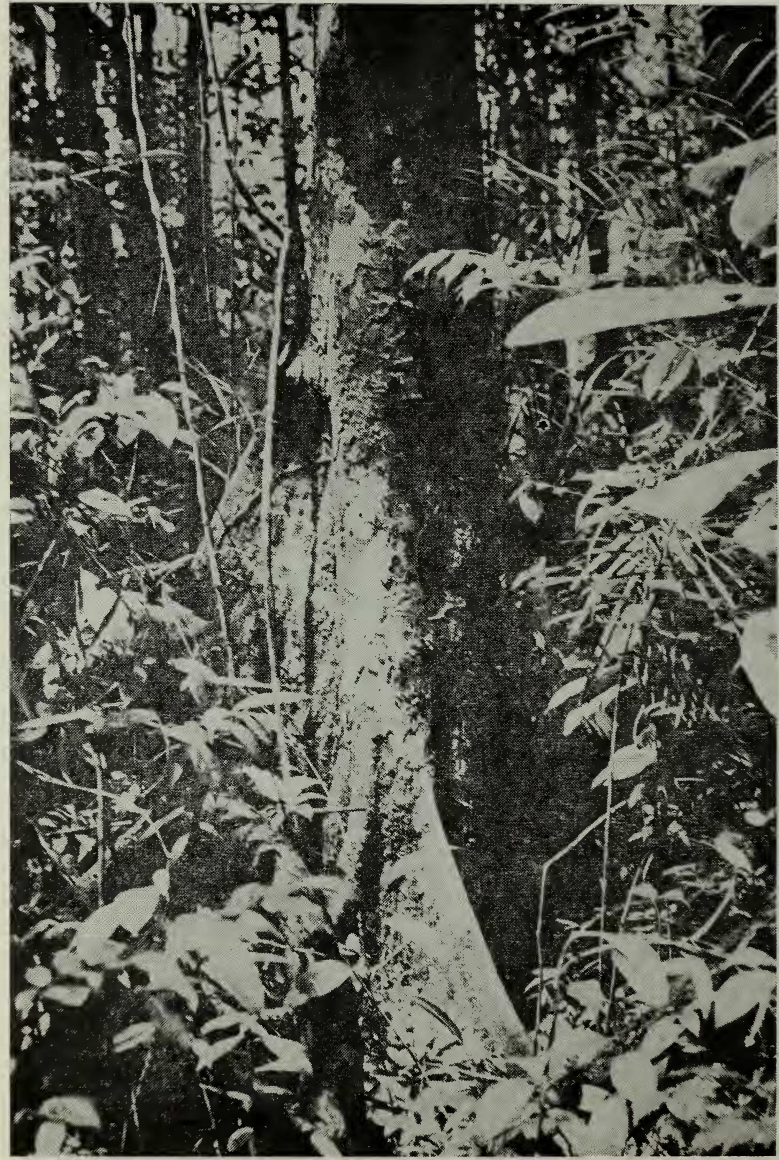
Fruits of *Dryobalanops oblongifolius* Dyer picked up from the type locality (S.19652, G. Matang); note the lenticellate pericarp and the variation in shape of the calyx tube.



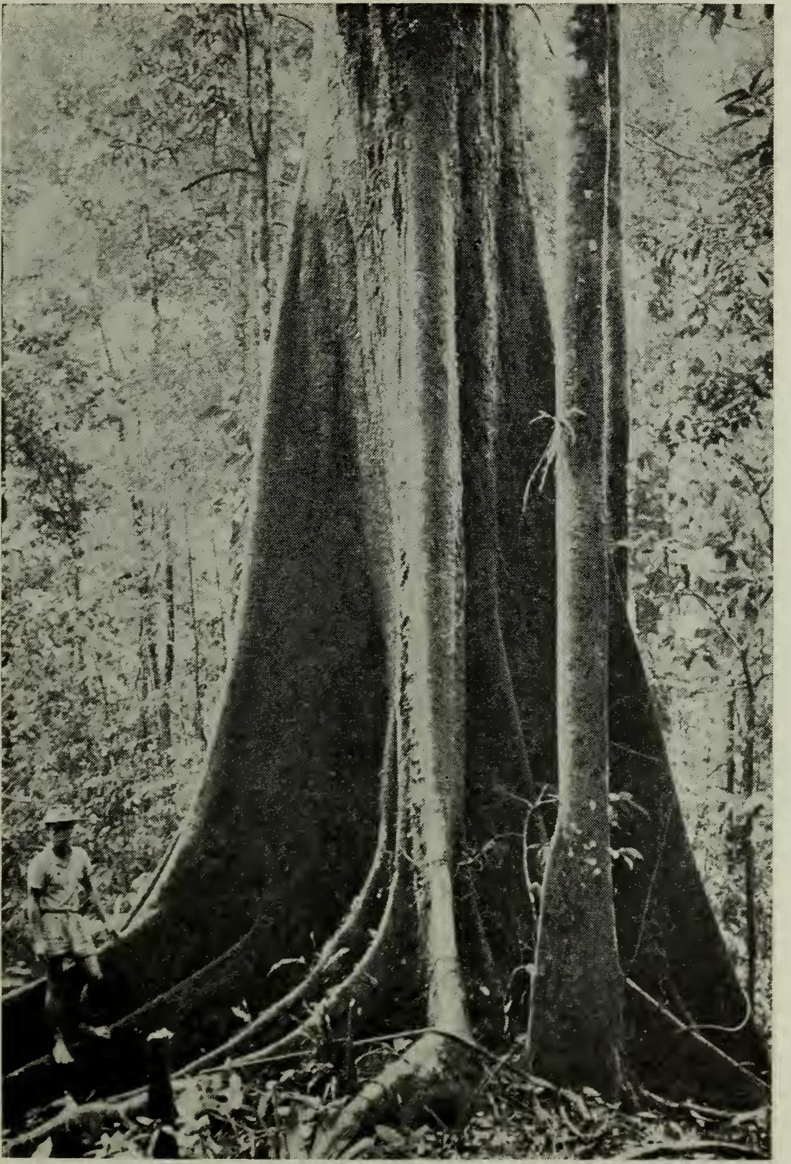
Bole of *Hopea altocollina* sp. nov.; Hose mountains, Sarawak. April 1964.



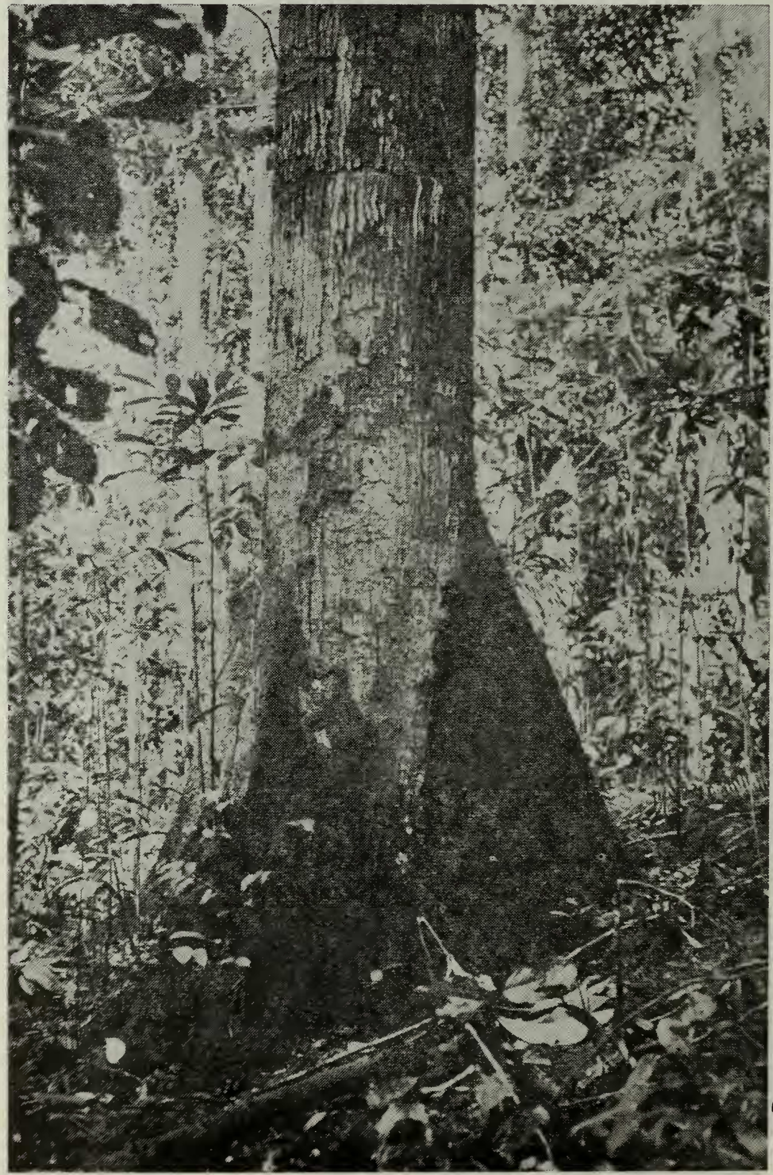
Bole of *Hopea tenuivervula* sp. nov.; Semengoh arboretum, Kuching. November 1963.



Bole of *Shorea cuspidata* sp. nov.; Semengoh arboretum, Kuching. November 1963.



Bole of a giant *Shorea mujongensis* sp. nov.: on the Mujong-Balui divide, Rejang, Sarawak. April 1964.



Bole of *Shorea sagittata* sp. nov.; Similajau F.R.; Bintulu. March 1963.